

1665-1673 STILLWELL AVENUE

BROOKLYN, NEW YORK 11223

Remedial Action Work Plan

NYSDEC BCP Number: C224307

Prepared for:

Mr. Sai Truong
Refulgence LLC
8738 20th Avenue
Brooklyn, NY 11214

Prepared by:

Tyll Engineering and Consulting PC
169 Commack Road, Suite H173
Commack, NY 11725
631-629-5373

&

RSK Environmental Group
132-02 89th Avenue, Suite 222
Richmond Hill, NY 11418

FEBRUARY 2025



CERTIFICATIONS

I, Karen Tyll, P.E., certify that I am currently a NYS registered professional engineer and that this Remedial Action Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and Green Remediation (DER-31).

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.



079520

NYS Professional Engineer #

2/11/2025

Date

A handwritten signature in cursive script, appearing to read "Karen Tyll", written over a horizontal line.

Signature

It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.



TABLE OF CONTENTS

CERTIFICATIONS.....	i
TABLE OF CONTENTS	ii
LIST OF ACRONYMS	viii
Executive Summary	ix
1.0 INTRODUCTION.....	1
1.1 Site Location and Description	1
1.2 Contemplated Redevelopment Plan.....	2
1.3 Description of Surrounding Property	2
2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS	4
2.1 Summary Remedial Investigations Performed	4
2.1.1 Borings and Wells	4
2.1.2 Samples Collected.....	4
2.1.3 Chemical Analytical Work Performed	5
2.1.4 Summary of RI Findings	6
2.2 Significant Threat.....	9
2.3 Site History.....	9
2.3.1 Past Uses and Ownership	9
2.3.2 Phase I and Phase II Reports.....	9
2.3.3 Sanborn Maps.....	10
2.4 Geologic and Hydrogeologic Conditions.....	11
2.5 Contamination Conditions.....	12
2.5.1 Conceptual Model of Site Contamination	12
2.5.2 Description of Areas of Concern.....	14
2.5.3 Identification of Standards, Criteria and Guidance	14
2.5.4 Soil/Fill Contamination	16
2.5.5 On-Site and Off-Site Groundwater Contamination	17
2.5.6 On-Site and Off-Site Soil Vapor Contamination	18
2.6 Environmental and Public health assessments	19

2.6.1 Qualitative Human Health Exposure Assessment	19
2.6.2 Fish & Wildlife Remedial Impact Analysis.....	23
2.7 Interim Remedial Action	24
2.8 Remedial Action Objectives	24
2.8.1 Groundwater	24
2.8.2 Soil.....	24
2.8.3 Soil Vapor	25
3.0 DESCRIPTION OF REMEDIAL ACTION PLAN	26
3.1 Evaluation of Remedial Alternatives.....	26
3.2 Selection of the Preferred Remedy	38
3.2.1 Zoning;	39
3.2.2 Applicable Comprehensive Community Master Plans or Land Use Plans	40
3.2.3 Surrounding Property Uses	40
3.2.4 Citizen Participation.....	40
3.2.5 Environmental Justice.....	40
3.2.6 Proximity to Natural Resources.....	40
3.2.7 Off-Site Groundwater Impacts	41
3.2.8 Proximity to Floodplains.....	41
3.2.9 Current Institutional Controls.....	41
3.3 Summary of selected Remedial Actions	42
4.0 Remedial Action Program	47
4.1 Governing Documents	47
4.1.1 Standards, Criteria and Guidance (SCGs)	47
4.1.2 Site Specific Health & Safety Plan (HASP).....	49
4.1.3 Quality Assurance Project Plan (QAPP)	49
4.1.4 Construction Quality Assurance Plan (CQAP)	49
4.1.5 Soil/Materials Management Plan (SMMP).....	51
4.1.6 Storm-Water Pollution Prevention Plan (SWPPP)	51
4.1.7 Community Air Monitoring Plan (CAMP).....	51
4.1.8 Contractors' Site Operations Plan (SOP);	52
4.1.9 Citizen Participation Plan.....	52
4.1.10 Green Remediation Principles	53

4.2 General Remedial construction information	54
4.2.1 Project Organization	54
4.2.2 Remedial Engineer	54
4.2.3 Remedial Action Construction Schedule	55
4.2.4 Work Hours.....	55
4.2.5 Site Security	55
4.2.6 Traffic Control.....	55
4.2.7 Contingency Plan	55
4.2.8 Worker Training and Monitoring.....	56
4.2.9 Agency Approvals	56
4.2.10 NYSDEC BCP Signage.....	57
4.2.11 Pre-Construction Meeting with NYSDEC	57
4.2.12 Emergency Contact Information	57
4.2.13 Remedial Action Costs	57
4.3 Site Preparation	57
4.3.1 Mobilization	57
4.3.2 Monitoring Well / Vapor Probe Decommissioning	58
4.3.3 Erosion and Sedimentation Controls.....	58
4.3.4 Stabilized Construction Entrance(s).....	58
4.3.5 Utility Marker and Easements Layout	59
4.3.6 Sheeting and Shoring.....	59
4.3.7 Equipment and Material Staging	59
4.3.8 Decontamination Area.....	59
4.3.9 Site Fencing.....	60
4.3.10 Demobilization.....	60
4.4 Reporting	60
4.4.1 Daily Reports.....	60
4.4.2 Monthly Reports.....	61
4.4.3 Other Reporting.....	62
4.4.4 Complaint Management Plan	62
4.4.5 Deviations from the Remedial Action Work Plan	63
5.0 REMEDIAL ACTION: MATERIAL REMOVAL FROM SITE	64

5.1 Soil Cleanup Objectives	64
5.2 Remedial Performance Evaluation (Post Excavation End-Point Sampling)	64
5.2.1 End-Point Sampling Frequency.....	64
5.2.2 Methodology	66
5.2.3 Reporting of Results.....	66
5.2.4 QA/QC.....	66
5.2.5 Data Usability Summary Reports (DUSRs).....	68
5.2.6 Reporting of End-Point Data in FER.....	68
5.3 ESTIMATED MATERIAL REMOVAL QUANTITIES.....	68
5.4 SOIL/MATERIALS MANAGEMENT PLAN	69
5.4.1 Soil Screening Methods	69
5.4.2 Stockpile Methods	70
5.4.3 Materials Excavation and Load Out.....	70
5.4.4 Materials Transport Off-Site.....	72
5.4.5 Materials Disposal Off-Site	73
5.4.6 Materials Reuse On-Site	75
5.4.7 Fluids Management	75
5.4.8 Demarcation	75
5.4.9 Backfill from Off-Site Sources.....	76
5.4.10 Stormwater Pollution Prevention.....	77
5.4.11 Contingency Plan	77
5.4.12 Community Air Monitoring Plan.....	78
5.4.13 Odor, Dust and Nuisance Control Plan	82
6.0 RESIDUAL CONTAMINATION TO REMAIN ON-SITE	84
7.0 ENGINEERING CONTROLS: COMPOSITE COVER SYSTEM	85
8.0 ENGINEERING CONTROLS: TREATMENT SYSTEMS	86
Sub-Slab Depressurization System	86
Soil Vapor Extraction (SVE) System	87
9.0 Criteria for Completion of Remediation/Termination of Remedial Systems	88
9.1 Composite Cover System.....	88
9.2 Sub-Slab Depressurization System (SSDS)	88
9.3 Soil Vapor Extraction System [SVE System].....	88

10.0 INSTITUTIONAL CONTROLS.....	0
10.1 ENVIRONMENTAL EASEMENT	0
10.2 SITE MANAGEMENT PLAN	3
11.0 FINAL ENGINEERING REPORT	5
11.1 CERTIFICATIONS.....	6
12.0 SCHEDULE	9

LIST OF FIGURES

- Figure 1** - Site Location Map
- Figure 2** – Site Boundary Map
- Figure 3** – Surrounding Land Use Map
- Figure 4.1** – Proposed Site Excavation Plan – Track 1
- Figure 4.2** – Proposed Site Excavation Plan – Track 2
- Figure 4.3** – Proposed Site Excavation Plan – Track 4
- Figure 5** - Truck Route Map
- Figure 6** - Endpoint Sample Location Map
- Figure 7** - Import/Backfill Location Maps
- Figure 8** – Composite Cover System Plan and Details
- Figure 9** - Vapor Barrier System Layout
- Figure 10** – SSDS and SVE Layout
- Figure 10 (A)** - SVE Details
- Figure 10 (B)** - SSDS Details
- Figure 11** – Proposed Development Excavation Plan
- Figure 12** – Team Organization Chart

LIST OF APPENDICES

Appendix A - Proposed Redevelopment Plans

Appendix B - Historical Sanborn Maps

Appendix C - Community Participation Plan

Appendix D - Quality Assurance Project Plan

Appendix E - Site Cleanup Objectives

Appendix F - Health and Safety Plan and Community Air Monitoring Plan

Appendix G – Team Resumes

Appendix H - Notice of Significant Threat

LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
CAMP	Community Air Monitoring Plan
CEQR	City Environmental Quality Review
CFR	Code of Federal Regulations
CHASP	Construction Health and Safety Plan
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
ECs/ICs	Engineering Controls and Institutional Controls
ELAP	Environmental Laboratory Accreditation Program
HASP	Health and Safety Plan
IRM	Interim Remedial Measure
NYS DEC	New York State Department of Environmental Conservation
NYCRR	New York Codes Rules and Regulations
NYS DEC	New York State Department of Environmental Conservation
NYS DEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation
NYS DOH	New York State Department of Health
NYS DOT	New York State Department of Transportation
OSHA	United States Occupational Health and Safety Administration
PE	Professional Engineer
PID	Photo Ionization Detector
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RAWP	Remedial Action Work Plan or Plan
RCA	Recycled Concrete Aggregate
RI	Remedial Investigation
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SSDS	Sub-Slab Depressurization System
SVE	Soil Vapor Extraction
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
UST	Underground Storage Tank
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

Tyll Engineering and Consulting, PC was retained by Mr. Sai Truong D.B.A. Refulgence LLC (the Participant) to prepare this Remedial Action Work Plan (RAWP) for the site located at 1665-1673 Stillwell Avenue, Brooklyn, New York (hereafter referred to as the Site). The Site was accepted into the New York State Brownfield Cleanup Program (BCP) and a Brownfield Cleanup Agreement (BCA) was executed with New York State Department of Environmental Conservation (NYSDEC) on June 14, 2021. A remedial investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended Site use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

This RAWP identifies and evaluates remedial action alternatives, including Track 1, Track 2, and Track 4 cleanups, their associated costs, and recommended and preferred remedy for this Site is a Track 2 cleanup. The remedy described in this document summarizes the nature and extent of contamination and provides sufficient information for establishment of remedial action objectives, evaluation of remedial action alternatives, and selection of a remedy that is protective of human health and the environment consistent with the use of the Site pursuant to RCNY§ 43-1407(f). This report is consistent with the procedures defined in the Title 6 of the New York Codes, Rules and Regulations (6 NYCRR) Part 375-3.8 and the NYSDEC Division of Environmental Remediation (DER) Program Policy: Technical Guidance for Site Investigation and Remediation (DER-10), and complies with applicable federal, state and local laws, regulations and requirements.

Site Description/Physical Setting/Site History

The Site is located at 1665 Stillwell Avenue in the Gravesend section of Brooklyn, NY. The Site consists of a rectangular-shaped lot identified as Block 6618; Lot 48 on the NYC Tax map and is located on the eastern side of Stillwell Avenue between Kings Highway to the north and Quentin Road to the south. The Site is enclosed by a one-story building (Brooklyn Public Library) and a two-story mixed-use building to the east, a one-story commercial building (garage) to the north, by a 2.5-story residential building to the south, and Stillwell Avenue to the west. The Site is

currently vacant, and was currently developed with a single-story concrete block building occupied by Ideal Cleaners. Access to the Site is via Stillwell Avenue to the west.

Information obtained from Fire Insurance maps during the performance of the Phase I ESA for the Site, indicated that the Site was developed prior to 1969 with a one-story building, with a parking area in the western portion of the lot. Past usage of the Site included a dairy, thrift shop and dry cleaners. Information obtained from City Directory for the Site listed previous occupant as Grandview Dairy from around year 1970 and 1973; 2) Stillwell Dairy in year 1976; 3) Wonder Hostess Thrift Shop around year 1985 and 1997; and then converted to a dry cleaner in 1999 (NYCDOB job number 300846155), and occupied by Ideal Cleaners from around 2000 through 2014. Information obtained from the NYCDOB records for the Site indicated usage of the Site was “ice cream dispensing stand” at 1671-1673 Stillwell Avenue in 1955 (Certificate of Occupancy # 142477, dated 01/19/1955), and “food store, with one loading/unloading berth and twelve accessory auto parking in open space” at 1665-1673 Stillwell Avenue, lots 48 and 50 (Certificate of Occupancy # 195912, dated 11/09/1966).

The site elevation is approximately 20-feet above sea level (USGS 7 1/2-Minute Coney Island, Brooklyn, NY Quadrangle, 2013) and the depth to groundwater on the Site was identified from approximately 16.68-feet to 17.5-feet below grade. Based on our interpretation of the physical setting sources, field data, and our experience, the Remedial Investigation inferred the groundwater flow direction in the vicinity of the Site is towards the southwest, in the direction of the Gravesend Bay. The Gravesend Bay is located approximately 1.05 miles from the Site. Surface water runoff on the Site flows to the surrounding streets that are connected to the City storm water sewer system. The topography in the vicinity of the Site is level with the ground surface covered by concrete and asphalt.

The Site was part of the Bensonhurst Rezoning dated 07/27/2005. The E-Designation for Hazardous Materials, (E-145) was placed on the Site by the New York City Department of City Planning (NYCDCP) under CEQR # 05DCP055K.

Summary of the Remedial Investigation

A Remedial Investigation (RI) was conducted by RSK Environmental Group (RSK) on May 5, 26-27, and 31, 2022. As part of the RI, RSK conducted a geophysical survey throughout the entire Site to determine the existence of any buried metallic anomalies and utilities and to clear the soil boring locations. RSK installed ten (10) soil borings across the entire Site and collected thirty (30) soil samples to evaluate soil quality. RSK installed six (6) permanent groundwater monitoring wells and collected six (6) groundwater samples. Four (4) soil vapor probes and one (1) outdoor air sample were installed.

The soil and groundwater samples were analyzed using Volatile Organic Compounds by EPA Method 8260, Semi-volatile Organic Compounds by EPA method 8270, Pesticides/PCBs by EPA Method 8081/8082, Target Analyte List metals by EPA Method 6010 and 7471 (All Groundwater samples were analyzed for both filtered (dissolved) and unfiltered (total) metals), and PFAS (NYSDEC Analyte List) by LC-MS/MS via EPA 537.1 and 1,4-Dioxane via EPA Method 8270 SIM.

All five (5) air samples were submitted to a NYS ELAP Certified Laboratory for chemical analysis, TO-15.

The findings of the remedial investigation are summarized below based on the laboratory analytical data for soil, soil vapor, and groundwater collected from the Site:

Geophysical Survey: A metallic area was detected with the TW-6 in the northeastern corner of the Site. Approximate dimensions measure 8-feet by 8-feet. GPR transects over the area did not image any discernable features.

Soil: Laboratory analytical results of the soil samples collected did not depict any elevated VOCs, SVOCs, PCBs, or 1,4-Dioxane. However, the results identified an exceedance of 4,4'-DDT ranging from 6.3 µg/kg to 8.7 µg/kg in SB-6 and SB-10 above Unrestricted Use SCOs (UUSCOs).

Analyte	NYSDEC UUSCO/RRSCO/CSCO/PGW (ug/kg)	Detections above Standards	Maximum Concentration (ug/kg)	Sample with max. concentration
4,4'-DDT	3.3/7,900/47,000/136,000	3/0/0/0	8.7	SB-10 (0'-2')

Analytical results of TAL Metals identified an exceedance above UUSCOs of Chromium ranging from 30.4 mg/kg to 40.7 mg/kg in SB-1 through SB-4; Copper at 51.9 mg/kg and 70.9 mg/kg in

SB-4 and SB-8, respectively; Lead ranging from 67.5 mg/kg to 309 mg/kg in SB-4 through SB-8 and SB-10; Mercury ranging from 0.27 mg/kg to 0.52 mg/kg in SB-4, SB-8, and SB-10; Nickel ranging from 30.9 mg/kg to 148 mg/kg in SB-1 through SB-10; and Zinc ranging from 109 mg/kg to 309 mg/kg in SB-5 through SB-8 and SB-10. Laboratory Analytical Results identified exceedance in Chromium above the PGW standards for all soil samples (ranging 19.2 ug/kg to 40.7 ug/kg), except in soil samples for deeper intervals in SB-5, SB-7 and SB-8.

Analyte	NYSDEC UUSCO/RRSCO/CSCO/PGW (mg/kg)	Detections above Standards	Maximum Concentration (mg/kg)	Sample with max. concentration
Chromium	30/NS/NS/19	5/0/0/21	40.7	SB-4 (6'-8')
Copper	50/270/270/1,720	2/0/0/0	70.9	SB-8 (0'-2')
Lead	63/400/1,000/450	7/0/0/0	309	SB-5 (0'-2')
Mercury	0.18/0.81/2.8/0.73	3/0/0/0	0.52	SB-4 (0'-2')
Nickel	30/310/310/130	26/0/0/0	148	SB-1 (14'-16')
Zinc	109/10,000/10,000/2,480	6/0/0/0	309	SB-5 (0'-2')

Analytical results of Per- and Polyfluoroalkyl Substances (PFASs) identified an exceedance of PFOS at 1.84 ng/g in SB-2 above UUSCO and Protection of Groundwater (PGW) standards; and PFOA at 0.789 ng/g in SB-1 in UUSCOs, indicating the presence of emerging contaminants.

Analyte	NYSDEC UUSCO/RRSCO/CSCO/PGW (ng/g)	Detections above Standards	Maximum Concentration (ng/g)	Sample with max. concentration
PFOS	0.88/44/440/1.0	1/0/0/1	1.84	SB-2 (14'-16')
PFOA	0.66/33/500/0.8	1/0/0/0	0.789	SB-1 (0'-2')

Groundwater: Laboratory analytical results of the groundwater samples collected did not depict any exceedances of SVOCs, Pesticides, PCBs or 1,4-Dioxane. However, laboratory results identified a consistency of VOC exceedances: 2-Isopropyltoluene ranging from 7.3 ug/L to 8.6 ug/L in GW-1, GW-3, and GW-4; Benzene at 2.1 ug/L in GW-6; Isopropyl benzene ranging from 27 ug/L to 100 ug/L in GW-1, GW-3, GW-4, and GW-6; n-Butylbenzene ranging from 6.4 ug/L to 14 ug/L in GW-1, GW-3, and GW-4; n-Propyl benzene ranging from 26 ug/L to 140 ug/L in GW-1, GW-3, GW-4, and GW-6; and sec-Butylbenzene ranging from 11 ug/L to 17 ug/L in GW-1, GW-3, and GW-4.

Analyte	NYSDEC GQS (ug/L)	Detections above Standards	Maximum Concentration (ug/L)	Sample with max. concentration
2-Isopropyltoluene	5	3	8.6	SB-2/GW-1
Benzene	1	1	2.1	SB-6/GW-6
Isopropyl benzene	5	3	100	SB-3/GW-3
n-Butylbenzene	5	3	14	SB-4/GW-4
n-Propyl benzene	5	4	140	SB-3/GW-3
Sec-Butylbenzene	5	3	17	SB-2/GW-1

Several TAL Metals identified the following exceedances in the filtered samples: Iron ranging from 0.608 mg/L to 3.13 mg/L in GW-1, GW-3, GW-5, and GW-6; Magnesium at 40.8 mg/L in GW-1; Manganese ranging from 0.97 mg/L to 6.17 mg/L in all groundwater samples analyzed; and Sodium ranging from 57.6 mg/L to 394 mg/L in all groundwater samples analyzed.

Analyte	NYSDEC GQS (mg/L)	Detections above Standards	Maximum Concentration (mg/L)	Sample with max. concentration
Iron	0.5	4	3.13	SB-3/GW-3
Magnesium	35	1	40.8	SB-2/GW-1
Manganese	0.3	6	6.17	SB-3/GW-3
Sodium	20	6	292	SB-7/GW-2

Laboratory analytical results of PFAS identified the following exceedances: PFOS ranging from 10.4 ng/L to 130 ng/L in all groundwater samples collected and PFOA ranging from 14.6 ng/L to 222 ng/L in all groundwater samples analyzed. Both levels of PFOS and PFOA are substantially high in GW-6.

Analyte	NYSDEC UUSCO/RRSCO/CSCO/PGW (ng/L)	Detections above Standards	Maximum Concentration (ng/L)	Sample with max. concentration
PFOS	0.01	6	130	SB-6/GW-6
PFOA	0.01	6	222	SB-6/GW-6

Soil Vapor: Soil vapors associated with gasoline products (BTEX) and chlorinated VOCs were detected in all four soil vapor samples, excluding the outdoor air sample. The soil vapor samples were compared to the minimum Soil Vapor Concentrations as set forth in the NYSDOH October 2006 Guidance for Soil Vapor Intrusion in the NYS Decision Matrices for Sub-slab Vapor and Indoor Air and subsequent updates (2017). The total concentration of BTEX ranged from 644.3

ug/m³ to 5,364 ug/m³ in SV-1 through SV-4 and is at 6.37 ug/m³ in OA-1. Chlorinated VOCs 1,1,1-Trichloroethane, 1,1-Dichloroethene, Cis-1,2-Dichloroethene, Methylene Chloride, and Vinyl Chloride were not detected. However, the total concentration of the chlorinated VOCs ranged from 1.34 ug/m³ to 949.3 ug/m³. Tetrachloroethene (PCE) significantly exceeded the NYSDOH matrices standards at concentration 915 ug/m³ in SV-1; Trichloroethene (TCE) was detected exceeding the NYSDOH matrices standards at concentration ranging from 3.54 ug/m³ to 17.7 ug/m³ in all vapor samples except for SV-3; whereas, Carbon tetrachloride was detected at 0.51 ug/m³ in SV-3 and 0.47 ug/m³ in OA-1.

Additional compounds were detected: 1,2,4-Trimethylbenzene at concentration ranging from 79.6 ug/m³ to 614 ug/m³ in SV-1 through SV-4 and at 1.21 ug/m³ in OA-1; 1,3,5-Trimethylbenzene ranging from 18.2 ug/m³ to 136 ug/m³ in SV-1 through SV-4; Chloroform at 16.6 ug/m³ in SV-1; Chloromethane at 1.34 ug/m³ in SV-3 and 1.17 ug/m³ in OA-1; Hexane ranging from 112 ug/m³ to 1,100 ug/m³ in SV-1 through SV-4 and 2.09 ug/m³ in OA-1; and Styrene ranging from 1.82 ug/m³ to 19.5 ug/m³ in SV-1 through SV-4.

Analyte	NYSDOH Matrices Concentrations (ug/m ³)	Decision Min.	Detections above Standards	Maximum Concentration (ug/m ³)	Sample with max. concentration
Tetrachloroethylene	100		2	915	SV-1
Trichloroethene	6		3	17.7	SV-1

According to the United States Geological Service (USGS), the glacial geology at the Site and in the immediate vicinity consists of Ordovician-Cambrian/Precambrian age Manhasset Formation, i.e., thin outwash from ice along Harbor Hill moraine, forming sandy plains. The Site is generally flat, with an average elevation of approximately 20-feet above mean sea level. According to the United States Department of Agriculture (USDA) the Site is underlain with urban land, outwash substratum consisting of cemented material up to 20-inches and deep gravelly coarse-loamy sand, with 0 to 3% slopes. Currently, the ground surface is covered by asphalt. According to previous environmental investigations performed by American Environmental Assessment & Solutions, Inc. (AEAS) during 2019, stratigraphy consists of historic fill material from surface to approximately 2-feet below grade underlain by clayey soil to a depth of 12-feet across the Site. Based on the remedial investigation (RI) activities completed on the Site by RSK, soil encountered consisted of brown to dark brown, fine grained-silty to clayey soil, with gravels and rocks.

Qualitative Human Health Exposure Assessment

The objective of the qualitative exposure assessment is to identify potential receptors and pathways for human exposure to the contaminants of concern (COC) that are present at, or migrating from, the Site. The identification of exposure pathways describes the route that the COC takes to travel from the source to the receptor. An identified pathway indicates that potential exposure exists; it does not imply that exposure actually occur.

Data and information reported in the RIR are sufficient to complete a QHHEA for this project. As part of the BCP process, a QHHEA was performed to determine whether the Site poses an existing or future health hazard to the Site's exposed or potentially exposed population. The sampling data from the RI were evaluated to determine whether there is any health risk under current and future conditions by characterizing the exposure setting, identifying exposure pathways, and evaluating contaminant fate and transport. This QHHEA was in accordance with Appendix 3B and Section 3.3 (b) 8 of the NYSDEC Draft DER-10. A more descriptive outlook on the QHHEA is included in the *Section 4.5* of this report which explains the contaminant sources, release and transport, the points of exposure and receptor population, along with methods of mitigation to avoid human and environment exposure.

Environmental Media & Exposure Route	Human Exposure Assessment
Direct contact with surface soils (and incidental ingestion)	People can come into contact if they trespass on the Site.
Direct contact with subsurface soils (and incidental ingestion)	People can come into contact if they complete ground-intrusive work at the Site.
Ingestion of groundwater	Contaminated groundwater is not being used for drinking water, as the area is served by the public water supply.
Direct contact with groundwater	People may come into contact if they complete ground-intrusive work in the event groundwater is encountered.
Inhalation of air (exposures related to soil vapor intrusion)	A monitoring program is being implemented to verify if additional actions will be needed to address exposures to soil vapor intrusion.
Direct contact and incidental ingestion of Surface water	No sources of surface water were noted on-Site or in the vicinity.

Summary of the Remedy

The proposed remedial action achieves protection of public health and the environment for the intended use of the property. The proposed remedial action achieves all of the remedial action objectives established for the project and addresses applicable standards, criterion, and guidance; is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants; is cost effective and implementable; and uses standards methods that are well established in the industry. The proposed remedial action will consist of:

1. Performance of a Special Community Air Monitoring Program (CAMP) for particulates and volatile organic carbon compounds to fulfil the special requirements for work within 20 feet of potentially exposed individuals and structures and special requirements for indoor work with co-located residences or facilities;
2. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas;
3. Utilizing Waste Characterization Study for soils generated during site redevelopment excavation activities for disposal purposes. The waste characterization soil samples were collected at a frequency dictated by the disposal facility;
4. Excavation of soil/fill exceeding RRSCOs and protection to groundwater (PGW) standards listed in **Appendix E**. For remediation purposes, the top 4-feet of Sitewide soil/fill will be excavated to meet the Restricted Residential SCOs. Approximately 1,185-cubic yards (1,778 tons) of soil/fill will be generated during remediation excavation;
5. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
6. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials;
7. Removal of all UST's that are encountered during soil/fill removal actions. Registration of tanks and reporting of any petroleum spills associated with UST's and appropriate closure

of these petroleum spills in compliance with applicable local, State and Federal laws and regulations;

8. Collection and analysis of eight (8) confirmation samples at the remedial excavation depths will be used to verify that the SCOs for the site have been achieved. If confirmation sampling indicates that SCOs were not achieved at the stated remedial depth, the Applicant must notify DEC, submit the sample results and, in consultation with DEC, determine if further remedial excavation is necessary. Further excavation for development will proceed after confirmation samples demonstrate that SCOs for the site have been achieved;
9. Appropriate off-Site disposal of all material removed from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal;
10. Import of materials to be used for backfill and cover in compliance with: (1) chemical limits, and (2) all Federal, State and local rules and regulations for handling and transport of material;
11. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations;
12. Construction and maintenance of a site cover to prevent human exposure to residual contaminated soil/fill remaining under the Site consisting of:
 - a. 4-inch-thick concrete building cellar slab under building footprint. A 6-inch layer of $\frac{3}{4}$ -inch crushed blue stone will be installed below the full concrete building slab, and
 - b. 4-inch-thick concrete slab underlain by a 6 layer of $\frac{3}{4}$ -inch crushed blue stone under the rear parking lot and driveway areas;
13. Installation of an active sub-slab depressurization system (SSDS) consisting of a single loop of horizontal pipe set in the middle of a 12-inch-deep gas permeable layer immediately beneath the building cellar slab and vapor barrier system. The SSDS gas permeable layer will consist of a 6-inch layer of $\frac{3}{4}$ -inch crushed blue stone placed directly beneath the

building cellar slab. The SSDS piping will be installed within a trench an additional 6 inches below the permeable layer. The horizontal piping will consist of looped 4-inch slotted HDPE corrugated pipe which will be fabric wrapped and connected to a 6-inch cast iron solid riser pipe that will penetrate the foundation wall and travel along the building rear exterior wall to the roof. The riser pipe will be fitted with an inline vacuum fan (Radonaway RP265 or equal) on the roof and finished a minimum of 3-feet above the top of the parapet wall and finished with a 6-inch goose neck pipe to prevent rain infiltration. The fan is required to be at least 10 feet from any HVAC air intake and nearby windows. The Active SSDS is an Engineering Control for the remedial action that will be installed under the supervision of the remedial engineer. The remedial engineer will certify in the FER that the SSDS was designed and properly installed to establish a vacuum in the gas permeable layer and a negative (decreasing outward) pressure gradient across the entire building slab to prevent vapor migration into the building;

14. Installation of an active Soil Vapor Extraction (SVE) system within a vapor hotspot area (SV-1 & SV-2 from RI, and SV-5 from the Phase-II) as identified in the previous RI on the northeastern corner of the Site (proposed rear yard) in order to remediate chlorinated and petroleum-related VOCs found in exceedance in that area. The system will be constructed with a fabric wrapped; 4-inch slotted (0.050" slot size) PVC SVE well installed vertically at a termination depth of 12-feet bgs with a porous annulus not to exceed 8-inches diameter. The SVE annulus will be filled with ¾-inch crushed blue stone to surround the slotted piping and will be connected to a horizontal 4-inch solid PVC pipe which will run beneath site grade and perpendicular toward the rear of the building's most northeastern section and travel along the building rear exterior wall to the first-floor roof. The pipe will be fitted with an inline vacuum fan and finished 3-feet above the top of the parapet line on the first-floor roof with a Schedule-40 PVC 6-inch goose neck pipe to prevent rain infiltration. The Active SVE is Engineering Control for the remedial action that will be installed under the supervision of the remedial engineer. The remedial engineer will certify in the FER that the SVE was designed and properly installed to establish a vacuum in the vapor hotspot area;

15. Publication of a Site Management Plan for long term management of residual contamination as required by the Environmental Easement, including plans for: (1) Institutional and Engineering Controls, (2) monitoring, (3) operation and maintenance and (4) reporting;
16. All responsibilities associated with the Remedial Action, including permitting requirements and pretreatment requirements, will be addressed in accordance with all applicable Federal, State and local rules and regulations; and
17. Submission of a FER that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.

Remedial activities will be performed at the Site in accordance with this NYSDEC-approved RAWP and the NYSDEC-issued Decision Document. All deviations from the RAWP and/or Decision Document will be promptly reported to NYSDEC for approval and fully explained in the FER.

REMEDIAL ACTION WORK PLAN

1.0 INTRODUCTION

Refulgence LLC entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) in June 2021, to investigate and remediate a 0.184-acre property located at 1665-1673 Stillwell Avenue in the Bensonhurst neighborhood of Brooklyn, New York. Refulgence LLC is a Volunteer in the Brownfield Cleanup Program. Mixed residential and commercial usage is proposed for the property. When completed, the Site will contain a mixed-use five-story building with a commercial space in the cellar and 1st floor, and sixteen (16) residential units 2nd floor through 5th floor. Refer to the Brownfield Cleanup Program (BCP) application for additional details.

This Remedial Action Work Plan (RAWP) summarizes the nature and extent of contamination as determined from data gathered during the Remedial Investigation (RI), performed between June 2019 and May 2022. It provides an evaluation of a Track 1 cleanup and other applicable Remedial Action alternatives, their associated costs, and the recommended and preferred remedy. The remedy described in this document is consistent with the procedures defined in DER-10, DER-31, and complies with all applicable standards, criteria and guidance. The remedy described in this document also complies with all applicable Federal, State and local laws, regulations and requirements. The NYSDEC and New York State Department of Health (NYSDOH) have determined that this Site does not pose a significant threat to human health and the environment (**Appendix H**). The RI for this Site did not identify fish and wildlife resources.

1.1 SITE LOCATION AND DESCRIPTION

The Site is located at 1665 Stillwell Avenue in the Gravesend section of Brooklyn, NY, and is identified as Block 6618; Lot 48 on the NYC Tax Map. The Site consists of a rectangular parcel, approximately 8,000-sq. ft. (0.184-acre) in size, and is bounded by Stillwell Avenue to the west, Kings Highway to the north, Quentin Road to the south, and West 13th Street to the east. A copy of the Site Location Map is provided as **Figure 1**. A site boundary map is attached to the RAWP as **Figure 2**.

1.2 CONTEMPLATED REDEVELOPMENT PLAN

The Remedial Action to be performed under the RAWP is intended to make the Site protective of human health and the environment consistent with the contemplated end use. The proposed redevelopment plan and end use is described here to provide the basis for this assessment. However, the Remedial Action contemplated under this RAWP may be implemented independent of the proposed redevelopment plan.

The proposed future use of the Site will consist of a new five-story (15,912.60-sq.ft.) mixed-use building with a commercial space in the cellar and 1st floor, and sixteen (16) residential units 2nd floor through 5th floor. The proposed FAR for the commercial use is 0.428 and for residential use it is 1.561 with a maximum building height of 59-feet 8-inches. The layout will consist of front yard/setback, a 38-feet paved rear yard to be utilized for off-street parking and a 14-feet 10-inch side yard to be utilized as a paved driveway. The proposed cellar depth (top of slab) for the new building will be 10-feet-4 inches below ground surface (bgs). The proposed elevator shaft will be 17.0-feet bgs. No uncapped or landscaped areas are proposed as part of this redevelopment.

The proposed cellar will have a 3,057-sq.ft. commercial space and the remainder will be utilized for bicycle parking, multiple mechanical/utility rooms, the elevator and stairs, refuse room, and two (2) restrooms. The proposed 1st floor will have a 3,499-sq. ft. commercial space, the residential lobby, a mechanical room, the elevator and stairs, and two (2) restrooms. Each residential floor above (2nd through 5th floors) will each contain four (4) 2-bedroom, residential units, elevator, stairs, and refuse room. Two (2) terraces are proposed for the residential units on the 5th floor. The proposed building will be serviced by an elevator on all floors. The roof bulkhead will consist of a 616.5-sq. ft. rooftop recreation space, elevator control room and will house the hot water heaters, boilers, and associated exhaust vents/stacks. A copy of the Site Redevelopment Plans is provided as **Appendix A**.

1.3 DESCRIPTION OF SURROUNDING PROPERTY

The current uses of the surrounding properties are commercial, institutional, and residential purposes. Brooklyn Public Library, (K-12), and Happy Club Children's Centre (Day-care) were

identified within a 250-ft. radius of the Site. PS/IS 686 Brooklyn Middle School, Gold Material Montessori School, Garden of Eden Home for Adults (Assisted living facility) and Little Scholars Day Care Centre were identified within a 500-ft. radius of the Site. No hospital was identified within a 500-ft. radius of the Site.

DIRECTION	ADJOINING USE(S)	VICINITY USE(S)
North	Residential, commercial, and Institutional properties <ul style="list-style-type: none"> • Along Kings Highway 	Mixed-Use
South	Residential properties <ul style="list-style-type: none"> • Along Quentin Road 	Residential-Use
East	Institutional and commercial properties <ul style="list-style-type: none"> • Along W 13th Street 	Mixed-Use
West	Residential properties <ul style="list-style-type: none"> • Along Stillwell Avenue 	Residential-Use

A copy of the surrounding land use map is provided as **Figure 3**.

2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS

The Site was investigated in accordance with the scope of work presented in the NYSDEC-approved Remedial Investigation (RI) Work Plan dated November 2021. RSK Environmental Group (RSK) performed the scope of work on May 5, 26-27, and 31, 2022. The REMEDIAL Investigation Report (RIR) was submitted to NYSDEC on October 2022 and approved by NYSDEC on January 10, 2025.

2.1 SUMMARY REMEDIAL INVESTIGATIONS PERFORMED

2.1.1 Borings and Wells

On May 26, 2022, RSK mobilized on-Site with the necessary drilling equipment to advance the ten (10) soil borings. The soil borings were advanced with a direct-push, Track-mounted Geoprobe Models 54LT and 6610DT drill rigs. The borings were installed throughout the Site for a full coverage and investigate the subsurface condition beneath the Site.

On May 26, 2022, RSK subcontracted with Coastal Environmental Solutions to provide and operate drilling equipment to install the six (6) permanent 2-inch diameter PVC groundwater wells on Site. An RSK representative was onsite to oversee the drilling activities. The monitoring wells were installed using direct push drilling methods.

Soil vapor and outdoor air sampling was conducted at the Site on May 31, 2022. Per approved RIWP, four (4) soil vapor samples (SV-1 through SV-4), from a depth of 10-feet bgs, and one (1) outdoor air sample (OA-1) were collected at the Site.

2.1.2 Samples Collected

SOIL: At each boring locations, two (2) samples were collected at depth intervals 0-2 feet shallow, and 6-8 feet, and a third sample was collected within two feet of the groundwater interface at approximately 14-16 feet. Duplicate soil samples were collected from soil boring locations SB-2 (14'-16') and SB-6 (14'-16').

GROUNDWATER: The six (6) groundwater monitoring wells were gauged, and the depth from the benchmark ranged from 16.68-feet to 17.50-feet. Groundwater flow was determined to be to the southwest. A duplicate groundwater sample was collected from monitoring well SB-4/GW-4.

SOIL VAPOR: The four (4) soil vapor samples and one (1) outdoor ambient air sample were collected using 6-liter, stainless-steel, cylindrical SUMMA canisters equipped with 8-hour flow controllers. The sampling canisters were provided by Phoenix Environmental Laboratories (PEL), of Manchester, CT.

2.1.3 Chemical Analytical Work Performed

Soil, groundwater, and soil vapor samples were submitted to Phoenix Environmental Laboratories, a NYSDOH Environmental Laboratory Accreditation Program (ELAP No. 11301)-certified laboratory, in Manchester, CT, for full analysis.

Soil and groundwater samples were analyzed using:

- Volatile Organic Compounds by EPA Method 8260;
- Semi-volatile Organic Compounds by EPA method 8270;
- Pesticides/PCBs by EPA Method 8081/8082;
- Target Analyte List metals by EPA Method 6010 and 7471 (All Groundwater samples were analyzed for both filtered (dissolved) and unfiltered (total) metals); and
- PFAS (NYSDC Analyte List) by LC-MS/MS via EPA 537.1 and 1,4-Dioxane via EPA Method 8270 SIM.

Soil Vapor samples were analyzed using:

Volatile Organic Compounds by USEPA Method TO-15.

All holding times were met. The laboratory did not report any irregularities with respect to their internal Quality Assurance / Quality Control.

2.1.4 Summary of RI Findings

Below is a summary of RI findings:

Geophysical Survey: A metallic area was detected in the northeastern corner of the Site. Approximate dimensions measure 8-feet by 8-feet. GPR transects over the area did not image any discernable features.

Soil: Laboratory analytical results of the soil samples collected did not depict any elevated VOCs, SVOCs, PCBs, or 1,4-Dioxane. However, the results identified an exceedance of 4,4'-DDT ranging from 6.3 µg/kg to 8.7 µg/kg in SB-6 and SB-10 above the UUSCOs.

Analyte	NYSDEC UUSCO/RRSCO/CSCO/PGW (ug/kg)	Detections above Standards	Maximum Concentration (ug/kg)	Sample with max. concentration
4,4'-DDT	3.3/7,900/47,000/136,000	3/0/0/0	8.7	SB-10 (0'-2')

Analytical results of TAL Metals identified an exceedance above UUSCOs of Chromium (30 mg/kg) ranging from 30.4 mg/kg to 40.7 mg/kg in SB-1 through SB-4; Copper (50 mg/kg) at 51.9 mg/kg and 70.9 mg/kg in SB-4 and SB-8, respectively; Lead (63 mg/kg) ranging from 67.5 mg/kg to 309 mg/kg in SB-4 through SB-8 and SB-10; Mercury (0.18 mg/kg) ranging from 0.27 mg/kg to 0.52 mg/kg in SB-4, SB-8, and SB-10; Nickel (30 mg/kg) ranging from 30.9 mg/kg to 148 mg/kg in SB-1 through SB-10; and Zinc (109 mg/kg) ranging from 109 mg/kg to 309 mg/kg in SB-5 through SB-8 and SB-10. Laboratory Analytical Results identified an exceedance in Chromium above the Protection of Groundwater (PGW) standards for all soil samples (ranging 19.2 ug/kg to 40.7 ug/kg), except in soil samples for deeper intervals in SB-5, SB-7 and SB-8.

Analyte	NYSDEC UUSCO/RRSCO/CSCO/PGW (mg/kg)	Detections above Standards	Maximum Concentration (mg/kg)	Sample with max. concentration
Chromium	30/NS/NS/19	5/0/0/21	40.7	SB-4 (6'-8')
Copper	50/270/270/1,720	2/0/0/0	70.9	SB-8 (0'-2')
Lead	63/400/1,000/450	7/0/0/0	309	SB-5 (0'-2')
Mercury	0.18/0.81/2.8/0.73	3/0/0/0	0.52	SB-4 (0'-2')
Nickel	30/310/310/130	26/0/0/0	148	SB-1 (14'-16')
Zinc	109/10,000/10,000/2,480	6/0/0/0	309	SB-5 (0'-2')

Analytical results of PFAS identified an exceedance of PFOS at 1.84 ng/g in SB-2 above UUSCO and PGW standards; and PFOA at 0.789 ng/g in SB-1 in UUSCOs, indicating the presence of emerging contaminants.

Analyte	NYSDEC UUSCO/RRSCO/CSCO/PGW (ng/g)	Detections above Standards	Maximum Concentration (ng/g)	Sample with max. concentration
PFOS	0.88/44/440/1.0	1/0/0/1	1.84	SB-2 (14'-16')
PFOA	0.66/33/500/0.8	1/0/0/0	0.789	SB-1 (0'-2')

Groundwater: Laboratory analytical results of the groundwater samples collected did not depict any exceedances of SVOCs, Pesticides, PCBs or 1,4-Dioxane. However, laboratory results identified VOC exceedances: 2-Isopropyltoluene ranging from 7.3 ug/L to 8.6 ug/L in GW-1, GW-3, and GW-4; Benzene at 2.1 ug/L in GW-6; Isopropyl benzene ranging from 27 ug/L to 100 ug/L in GW-1, GW-3, GW-4, and GW-6; n-Butylbenzene ranging from 6.4 ug/L to 14 ug/L in GW-1, GW-3, and GW-4; n-Propyl benzene ranging from 26 ug/L to 140 ug/L in GW-1, GW-3, GW-4, and GW-6; and sec-Butylbenzene ranging from 11 ug/L to 17 ug/L in GW-1, GW-3, and GW-4.

Analyte	NYSDEC GQS (ug/L)	Detections above Standards	Maximum Concentration (ug/L)	Sample with max. concentration
2-Isopropyltoluene	5	3	8.6	SB-2/GW-1
Benzene	1	1	2.1	SB-6/GW-6
Isopropyl benzene	5	3	100	SB-3/GW-3
n-Butylbenzene	5	3	14	SB-4/GW-4
n-Propyl benzene	5	4	140	SB-3/GW-3
Sec-Butylbenzene	5	3	17	SB-2/GW-1

Several TAL Metals identified the following exceedances in the filtered samples: Iron ranging from 0.608 mg/L to 3.13 mg/L in GW-1, GW-3, GW-5, and GW-6; Magnesium at 40.8 mg/L in GW-1; Manganese ranging from 0.97 mg/L to 6.17 mg/L in all groundwater samples analyzed; and Sodium ranging from 57.6 mg/L to 394 mg/L in all groundwater samples analyzed.

Analyte	NYSDEC GQS (mg/L)	Detections above Standards	Maximum Concentration (mg/L)	Sample with max. concentration
Iron	0.5	4	3.13	SB-3/GW-3
Magnesium	35	1	40.8	SB-2/GW-1
Manganese	0.3	6	6.17	SB-3/GW-3
Sodium	20	6	292	SB-7/GW-2

Laboratory analytical results of PFAS identified the following exceedances: PFOS ranging from 10.4 ng/L to 130 ng/L in all groundwater samples collected and PFOA ranging from 14.6 ng/L to 222 ng/L in all groundwater samples analyzed. Both levels of PFOS and PFOA are substantially high in GW-6.

Analyte	NYSDEC UUSCO/RRSCO/CSCO/PGW (ng/L)	Detections above Standards	Maximum Concentration (ng/L)	Sample with max. concentration
PFOS	0.01	6	130	SB-6/GW-6
PFOA	0.01	6	222	SB-6/GW-6

Soil Vapor: Soil vapors associated with gasoline products (BTEX) and chlorinated VOCs were detected in all four soil vapor samples, excluding the outdoor air sample. The soil vapor samples were compared to the minimum Soil Vapor Concentrations as set forth in the NYSDOH October 2006 Guidance for Soil Vapor Intrusion in the NYS Decision Matrices for Sub-slab Vapor and Indoor Air and subsequent updates (2017). The total concentration of BTEX ranged from 644.3 ug/m³ to 5,364 ug/m³ in SV-1 through SV-4 and is at 6.37 ug/m³ in OA-1. Chlorinated VOCs 1,1,1-Trichloroethane, 1,1-Dichloroethene, Cis-1,2-Dichloroethene, Methylene Chloride, and Vinyl Chloride were not detected. However, the total concentration of the chlorinated VOCs ranged from 1.34 ug/m³ to 949.3 ug/m³. Tetrachloroethene (PCE) significantly exceeded the NYSDOH matrices standards at concentration 915 ug/m³ in SV-1; Trichloroethene (TCE) was detected exceeding the NYSDOH matrices standards at concentration ranging from 3.54 ug/m³ to 17.7 ug/m³ in in all vapor samples except for SV-3; whereas, Carbon tetrachloride was detected at 0.51 ug/m³ in SV-3 and 0.47 ug/m³ in OA-1.

Additional compounds were detected: 1,2,4-Trimethylbenzene at concentration ranging from 79.6 ug/m³ to 614 ug/m³ in SV-1 through SV-4 and at 1.21 ug/m³ in OA-1; 1,3,5-Trimethylbenzene ranging from 18.2 ug/m³ to 136 ug/m³ in SV-1 through SV-4; Chloroform at 16.6 ug/m³ in SV-1; Chloromethane at 1.34 ug/m³ in SV-3 and 1.17 ug/m³ in OA-1; Hexane ranging from 112 ug/m³ to 1,100 ug/m³ in SV-1 through SV-4 and 2.09 ug/m³ in OA-1; and Styrene ranging from 1.82 ug/m³ to 19.5 ug/m³ in SV-1 through SV-4.

Analyte	NYSDOH Matrices Concentrations (ug/m ³)	Decision Min.	Detections above Standards	Maximum Concentration (ug/m ³)	Sample with max. concentration
Tetrachloroethylene	100		2	915	SV-1
Trichloroethene	6		3	17.7	SV-1

2.2 SIGNIFICANT THREAT

The NYSDEC and NYSDOH have determined that this Site does not pose a significant threat to human health and the environment on August 23, 2023. The Notice of that determination has been provided on February 11, 2025. A copy of the notice is included in **Appendix H**.

2.3 SITE HISTORY

2.3.1 Past Uses and Ownership

Based upon review of available historical information, the Site was vacant land prior to 1950, then developed sometime between 1950 and 1969, with a one-story building located in the eastern portion of the lot. Usage of the Site included a dairy, thrift shop and dry cleaners. The following occupants were identified at the Site:

- Grandview Dairy from around year 1970 and 1973;
- Stillwell Dairy in year 1976;
- Wonder Hostess Thrift Shop around year 1985 and 1997; and
- Ideal Cleaners from around 2000 through 2014.

NYCDOB job number 300846155 indicated that the Site was converted to a dry cleaner in 1999. Information obtained from the NYCDOB records for the Site indicated usage of the Site was “ice cream dispensing stand” at 1671-1673 Stillwell Avenue in 1955 (Certificate of Occupancy # 142477, dated 01/19/1955), and “food store, with one loading/unloading berth and twelve accessory auto parking in open space” at 1665-1673 Stillwell Avenue, lots 48 and 50 (Certificate of Occupancy # 195912, dated 11/09/1966).

2.3.2 Phase I and Phase II Reports

A Phase-II Environmental Subsurface Investigation was conducted by American Environmental Assessment & Solutions, Inc. (AEAS) on June 19 and 24, 2019, to characterize the subsurface soil and groundwater quality to comply with the E-Designation requirements set forth by New York City Department of City Planning (NYCDCP) for the Site. As part of the Phase-II, a total of seven

(7) soil borings, three (3) temporary monitoring wells, and six (6) soil vapor probes were collected for laboratory analysis. The scope of work also included a geophysical survey of the Site.

No anomalies indicative of tanks, drums, or buried objects were identified during the geophysical survey at the Site. No VOCs, SVOCs, Pesticides, or Polychlorinated Biphenyls (PCBs) were detected exceeding their respective Restricted Use SCOs Part 375-6.8(b) Residential in any of the soil samples obtained. Tetrachloroethene (PCE) was identified in four (4) of the soil borings (detected at a max. of 580 µg/kg), but well below UUSCOs. Target Analyte List (TAL) Metals were identified exceeding UUSCOs in all soil borings, including Chromium, Copper, Lead, Nickel, Mercury, and Zinc. The compound 1,4-dioxane and Per- and Polyfluoroalkyl Substances (PFASs) were not detected in the soil samples.

Groundwater analysis identified four (4) VOCs and five (5) SVOCs exceeding their respective NYSDEC Groundwater Quality Standards (GQS). The compound 1,4-dioxane and Per- and Polyfluoroalkyl Substances (PFASs) were not detected in the groundwater samples. Soil vapor analytical results identified VOCs exceeding New York State Department of Health (NYSDOH) Final Guidance on Soil Vapor Intrusion, including petroleum-related VOCs (BTEX) and chlorinated VOCs PCE and TCE.

2.3.3 Sanborn Maps

All Sanborn Maps available for this Site were reviewed prior to preparation of the RAWP. Sanborn maps were obtained from EDR for completion of the Phase I ESA for the Site. The Sanborn maps are presented in **Appendix B**. A summary of the review of the Sanborn maps is presented below:

Year(s)	Interpreted Property Use
1906, 1930, 1950	Vacant land.
1969, 1977, 1979, 1980, 1981, 1983, 1986, 1987	The Site was developed with a one-story building located in the eastern portion of the lot. Usage of the building was not noted; however, the western portion of the Site was noted as “parking”. No changes were identified on the subsequent maps through 1989.

Year(s)	Interpreted Property Use
1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 2001, 2002, 2003, 2004, 2005, 2006, 2007	1 story building with parking area to the west. Usage noted as “commercial”. No changes were identified on the subsequent Fire Insurance maps through 2007.
1895, 1929, 1968, 1976, 1991	No coverage

2.4 GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

Soil / Fill material

The stratigraphy of the site, from the surface down, consists of approximately two (2) feet of historic fill material, underlain by clayey soil to a depth of twelve (12) feet across the subsurface of the property.

Soil / fill material encountered during the RI consists of brown, fine-grained silty to clayey soil, containing rocks.

Hydrogeology

Groundwater level measurements were collected during gauging events at the Site on June 24th, 2019 by a previous consultant. Groundwater was encountered in the monitoring wells at depths ranging from 16.89-feet to 17.25-feet below grade. Site-specific groundwater flow has been determined to be towards the southwest, in the direction of the Gravesend Bay. The Gravesend Bay is located approximately 1.05-miles from the Site. Surface water runoff on the Site flows to the surrounding Streets that are connected to the City storm water sewer system. The elevation of the Site is approximately 20-feet above sea level (USGS 7 1/2-Minute Coney Island, Brooklyn, NY Quadrangle, 2013). The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Number 3604970351F (effective September 2007) for the Site area was reviewed to assess whether the Site is located within a designated flood plain or flood zone. The FIRM indicated that the Site is located within flood Zone X. Areas within flood Zone X identified as Other Areas on the map (i.e., no hatch pattern) are determined to be outside the 0.2% annual chance or 500-year floodplain.

2.5 CONTAMINATION CONDITIONS

This section of the RAWP describes the Areas of Concern (AOCs) identified and the detected contaminants in soil, groundwater and soil vapor based upon the RI data:

2.5.1 Conceptual Model of Site Contamination

A conceptual Site model (CSM) was developed based on the findings of the RI to produce a simplified framework for understanding the distribution of impacted materials, potential migration pathways, and potentially complete exposure pathways. Consistent with NYSDEC RAWP guidance, the on-Site and Off-Site components are discussed independently with the interaction between the two noted where technically appropriate to complete the overall CSM

On-Site

Per the Phase-II ESI conducted by AEAS in July 2019, no VOCs, SVOCs, pesticides, PCBs, 1,4-Dioxane and PFAS were detected in soil samples. Several metals, below RRSCOs, were detected. However, in groundwater, petroleum-related four (4) VOCs and five (5) SVOCs were detected above GQS. No PCBs, pesticides, TAL metals or PFAS were detected above GQS were detected. Soil vapor samples showed significant exceeding concentrations of BTEX-related CVOCs contaminants.

A similar array of contaminants resulted from the RI activities conducted on-Site by RSK in May 2022. The primary COCs are petroleum-related (BTEX), VOCs, SVOCs, and heavy metals in the groundwater samples and petroleum-related VOCs and CVOCs in the soil vapors. The Contaminants identified had significant concentrations above the UUSCOs and PGW (Chromium in soil) Site-wide. PCE and TCE were found to be the primary Contaminant of Concern in soil vapor at the Site. The highest levels of PCE and TCE were identified in the northeastern corner of the Site at a depth of 10-feet below grade. The likely source of the PCE and TCE was the operations of a former dry cleaner tenant at the Site. The former dry cleaner tenant began operations in 1999/2000 and was reported to cease operations in 2014. Dry cleaning operations were halted shortly after transfer of ownership of the Site in 2014.

Based upon the historical usage of the Site as a dry cleaner and the concentrations of PCE and TCE identified in the soil vapor, it is likely that dry cleaning solvents historically spilled and entered the subsurface through the pavement in the northeastern portion of the Site. PCE and TCE were not identified in the groundwater during the RI. Groundwater was encountered in the monitoring wells at depths ranging from 16.68-feet to 17.50-feet below grade. Site-specific groundwater flow has been determined to be towards the southwest, in the direction of the Gravesend Bay.

Off-Site

PCE and TCE contaminants were not identified in the groundwater up-gradient or downgradient beneath the Site. Soil vapor generally migrates with groundwater contamination. Based upon the RI data, the soil vapor contaminants appear to be migrating horizontally between subsurface sediments.

The petroleum-related compounds are attributed to the spill site located at 125 Kings Highway, approximately 150-feet north of the Site at a higher gradient. 125 Kings Highway was historically utilized as a gasoline/service station with four (4) on-site 4,000-gallon gasoline USTs (PBS ID 2-151378). The tanks were closed and removed on March 13, 19, and 20, 2019 (NYCDOB Job # 321905042, December 12, 2018), and the spill was recorded on March 15, 2019 (Spill # 1812287); consequent to the leaking USTs. Based on the OER documents research (OER Site # 21EHAZ037K), remediation and construction were completed and the database was last updated on July 1, 2022. The soil samples indicated no exceedances in VOCs, and PCBs, however, one (1) SVOC, five (5) metals and two (2) PFAS compounds were detected. Groundwater samples indicated significant exceedances in petroleum-related compounds (BTEX) VOCs and SVOCs, two (2) metals and several PFAS compounds. Soil vapor samples indicated elevated levels of petroleum-related VOCs (ranging from 33.2 ug/m³ to 8,970 ug/m³), and CVOCs (ranging from 13.3 ug/m³ (TCE) to 668 ug/m³ (PCE)).

Another spill site located at 137 Kings Highway (east adjacent to 125 Kings Highway) was registered with the NYSDEC Spill database for a #2 fuel oil spill in June 15, 1998 (Spill #9803303), and closed on November 10, 1998. A 275-gallon waste/used oil AST is also currently registered with the PBS unit as ID 2-603523. Per the NYCDOB search, the site was historically utilized as a

parking lot with an office building circa 1959 (CO # 167139), a repair/lubrication shop for vehicles “no body work”, with a loading dock and a fuel oil approval # 8491 dated 12/12/1963, circa 1964 (CO # 186981), a repair/lubrication shop for vehicles “no body work”, and a loading dock circa 1983 (CO #221076), and a chemical manufacturer circa 1919 (CO # 120). Contaminants were not identified in the groundwater downgradient at the Site.

2.5.2 Description of Areas of Concern

The areas of concern on-Site are the soil vapor impacts identified at the Site. The specific area of concern is the northeastern portion of the Site, shed area, where the dry-cleaning solvents were reported to have been stored and where the soil vapor impacts were identified at the highest levels. There are no known USTs associated with the Site. There are no known additional sources of contamination other than low-levels of up-gradient groundwater impacts.

2.5.3 Identification of Standards, Criteria and Guidance

The following standards and criteria typically were applied to the Remedial Investigation, and will apply to remedy selection, UST closures, and site management activities:

- DER-10 – Technical Guidance for Site Investigation and Remediation
- DER-13 – Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York
- DER-23 – Citizen Participation Handbook for Remedial Programs (March, 2010)
- TOGS 1.1.1 - Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations
- 6 NYCRR Part 613 - Petroleum Bulk Storage
- 6 NYCRR Part 371 - Identification and Listing of Hazardous Wastes
- 6 NYCRR Subpart 374-2 - Standards for the Management of Used Oil
- 40 CFR Part 280 - Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks
- CP-51- Soil Cleanup Guidance (2010)
- Spill Response Guidance Manual (1995)
- Permanent Closure of Petroleum Storage Tanks (2003)

- DAR-1 (formerly Air Guide 1) (1997) - Guidelines for the Control of Toxic Ambient Air Contaminants
- 29 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response
- 40 CFR Part 144 - Underground Injection Control Program
- 10 NYCRR Part 67 – Lead Poisoning Prevention and Control
- 12 NYCRR Part 56 - Industrial Code Rule 56 (Asbestos)
- 6 NYCRR Part 175 - Special Licenses and Permits--Definitions and Uniform Procedures
- 6 NYCRR Part 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities
- 6 NYCRR Subpart 374-1 - Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
- 6 NYCRR Subpart 374-3 - Standards for Universal Waste
- 6 NYCRR Part 375 - Environmental Remediation Programs
- 6 NYCRR Part 608 - Use and Protection of Waters
- 6 NYCRR Parts 700-706 – Classifications and Standards of Quality and Purity
- DER-2 - Making Changes To Selected Remedies (Revised April, 2008)
- STARS #1 - Petroleum-Contaminated Soil Guidance Policy (1992) (Sections III and IV have been replaced CP-51)
- STARS #2 - Bio cell and Bio pile Designs for Small-Scale Petroleum-Contaminated Soil Projects
- TAGM 3028 - "Contained In" Criteria for Environmental Media: Soil Action Levels (August 1997)
- TOGS 1.3.8 - New Discharges to Publicly Owned Treatment Works
- TOGS 2.1.2 - Underground Injection/Recirculation (UIR) at Groundwater Remediation Sites
- U.S. EPA OSWER Directive 9200.4-17 - Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (December 1997)

- NYSDOH Environmental Health Manual CSFP-530 - "Individual Water Supplies - Activated Carbon Treatment Systems".

2.5.4 Soil/Fill Contamination

2.5.4.1 Summary of Soil/Fill Data

- Laboratory analytical results of the soil samples collected did not depict any elevated VOCs, SVOCs, PCBs, or 1,4-Dioxane. However, the results identified an exceedance of 4,4'-DDT ranging from 6.3 µg/kg to 8.7 µg/kg in SB-6 and SB-10 above UUSCOs. Analytical results of TAL Metals identified an exceedance above UUSCOs of Chromium ranging from 30.4 mg/kg to 40.7 mg/kg in SB-1 through SB-4; Copper at 51.9 mg/kg and 70.9 mg/kg in SB-4 and SB-8, respectively; Lead ranging from 67.5 mg/kg to 309 mg/kg in SB-4 through SB-8 and SB-10; Mercury ranging from 0.27 mg/kg to 0.52 mg/kg in SB-4, SB-8, and SB-10; Nickel ranging from 30.9 mg/kg to 148 mg/kg in SB-1 through SB-10; and Zinc ranging from 109 mg/kg to 309 mg/kg in SB-5 through SB-8 and SB-10. Laboratory Analytical Results identified exceedance in Chromium above the PGW standards for all soil samples (ranging 19.2 ug/kg to 40.7 ug/kg), except in soil samples for deeper intervals in SB-5, SB-7 and SB-8. Analytical results of PFAS identified an exceedance of PFOS at 1.84 ng/g in SB-2 above UUSCO and PGW standards; and PFOA at 0.789 ng/g in SB-1 in UUSCOs, indicating the presence of emerging contaminants.
- Tables 3 through Table 9 of the Remedial Investigation Report by RSK outlines the above results.

2.5.4.1 Comparison of Soil/Fill with SCGs

- Laboratory Analytical Results identified exceedance in Chromium above the PGW standards for all soil samples, except in soil samples for the deeper intervals in SB-5, SB-7 and SB-8; along with four metals exceeded above UUSCOs. Analytical results of PFAS identified an exceedance of PFOS above UUSCO and PGW standards; and PFOA above UUSCOs, indicating the presence of emerging contaminants.

- Figure 3A of the RIR is a spider map that shows the location and summarizes the exceedances of UUSCOs for all soil/fill.

2.5.5 On-Site and Off-Site Groundwater Contamination

2.5.5.1 Summary of Groundwater Data

- Laboratory analytical results of the groundwater samples collected did not depict any exceedances of SVOCs, Pesticides, PCBs or 1,4-Dioxane. However, laboratory results identified a consistency of VOC exceedances: 2-Isopropyltoluene ranging from 7.3 ug/L to 8.6 ug/L in GW-1, GW-3, and GW-4; Benzene at 2.1 ug/L in GW-6; Isopropyl benzene ranging from 27 ug/L to 100 ug/L in GW-1, GW-3, GW-4, and GW-6; n-Butylbenzene ranging from 6.4 ug/L to 14 ug/L in GW-1, GW-3, and GW-4; n-Propyl benzene ranging from 26 ug/L to 140 ug/L in GW-1, GW-3, GW-4, and GW-6; and sec-Butylbenzene ranging from 11 ug/L to 17 ug/L in GW-1, GW-3, and GW-4. Several TAL Metals identified the following exceedances in the filtered samples: Iron ranging from 0.608 mg/L to 3.13 mg/L in GW-1, GW-3, GW-5, and GW-6; Magnesium at 40.8 mg/L in GW-1; Manganese ranging from 0.97 mg/L to 6.17 mg/L in all groundwater samples analyzed; and Sodium ranging from 57.6 mg/L to 394 mg/L in all groundwater samples analyzed. Laboratory analytical results of PFAS identified the following exceedances: PFOS ranging from 10.4 ng/L to 130 ng/L in all groundwater samples collected and PFOA ranging from 14.6 ng/L to 222 ng/L in all groundwater samples analyzed. Both levels of PFOS and PFOA are substantially high in GW-6.
- Tables 9 through Table 17 of the Remedial Investigation Report by RSK outlines the results of the RI in a tabular format.

2.5.5.2 Comparison of Groundwater with SCGs

- Six (6) VOCs including 2- Isopropyl toluene, Benzene, Isopropyl benzene, n-Butylbenzene, n-Propyl benzene, and sec-Butylbenzene; nine (9) SVOCs including Acenaphthene, Fluoranthene, Naphthalene, Benzo(a)Anthracene, Benzo(b)Fluoranthene,

Benzo(k)Fluoranthene, Bis(2-ethylhexyl) phthalate, Chrysene, and Indeno(1,2,3-cd) pyrene; four (4) Iron, Magnesium, Manganese, and Sodium; and two (2) PFAS (PFOA and PFOS) were all detected throughout the Site.

- A spider map that indicates the location(s) of and summarizes exceedances of AWQS prior to the remedy is shown in Figure 3B of the RIR by RSK.

2.5.6 On-Site and Off-Site Soil Vapor Contamination

- Soil vapors associated with BTEX and chlorinated VOCs were detected in all air samples, excluding the outdoor air sample. The total concentration of BTEX ranged from 644.3 ug/m³ to 5,364 ug/m³ in SV-1 through SV-4 and is at 6.37 ug/m³ in OA-1. Chlorinated VOCs 1,1,1-Trichloroethane, 1,1-Dichloroethene, Cis-1,2-Dichloroethene, Methylene Chloride, and Vinyl Chloride were not detected. PCE was detected at concentration ranging from 1.14 ug/m³ to 915 ug/m³ in SV-1 through SV-4 and 0.41 ug/m³ in OA-1; TCE was detected at concentration ranging from 3.54 ug/m³ to 17.7 ug/m³ in in all vapor samples except for SV-3; Carbon tetrachloride was detected at 0.51 ug/m³ in SV-3 and 0.47 ug/m³ in OA-1. Additional compounds were detected in the vapor samples: 1,2,4-Trimethylbenzene at concentration ranging from 79.6 ug/m³ to 614 ug/m³ in SV-1 through SV-4 and at 1.21 ug/m³ in OA-1; 1,3,5-Trimethylbenzene ranging from 18.2 ug/m³ to 136 ug/m³ in SV-1 through SV-4; Chloroform at 16.6 ug/m³ in SV-1; Chloromethane at 1.34 ug/m³ in SV-3 and 1.17 ug/m³ in OA-1; Hexane ranging from 112 ug/m³ to 1,100 ug/m³ in SV-1 through SV-4 and 2.09 ug/m³ in OA-1; and Styrene ranging from 1.82 ug/m³ to 19.5 ug/m³ in SV-1 through SV-4.
- Table 18 of the Remedial Investigation Report by RSK outlines these results.

2.5.6.1 Comparison of Soil Vapor with SCGs

- VOCs including 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, Chloroform, Chloromethane, Hexane, Styrene, BTEX, PCE (Tetrachloroethene), Trichloroethene (TCE) and Carbon Tetrachloride were detected above NYSDOH Ambient Air Background Levels.

- A spider map that indicates the location(s) of and summarizes soil vapor data prior to the remedy is shown in Figure 3C of the RIR by RSK.

2.6 ENVIRONMENTAL AND PUBLIC HEALTH ASSESSMENTS

2.6.1 Qualitative Human Health Exposure Assessment

The objective of the qualitative exposure assessment is to identify potential receptors and pathways for human exposure to the contaminants of concern (COC) that are present at, or migrating from, the Site. The identification of exposure pathways describes the route that the COC takes to travel from the source to the receptor. An identified pathway indicates that the potential for exposure exists; it does not imply that exposures actually occur.

Data and information reported in the Remedial Investigation Report (RIR) by RSK are sufficient to complete a Qualitative Human Health Exposure Assessment (QHHEA) for this project. As part of the VCP process, a QHHEA was performed to determine whether the Site poses an existing or future health hazard to the Site's exposed or potentially exposed population. The sampling data from the RI were evaluated to determine whether there is any health risk under current and future conditions by characterizing the exposure setting, identifying exposure pathways, and evaluating contaminant fate and transport. This QHHEA was prepared in accordance with Appendix 3B and Section 3.3 (b) 8 of the NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation.

Environmental Media & Exposure Route	Human Exposure Assessment
Direct contact with surface soils (and incidental ingestion)	People can come into contact if they trespass on the Site.
Direct contact with subsurface soils (and incidental ingestion)	People can come into contact if they complete ground-intrusive work at the Site.

Ingestion of groundwater	Contaminated groundwater is not being used for drinking water, as the area is served by the public water supply.
Direct contact with groundwater	People may come into contact if they complete ground-intrusive work in the event groundwater is encountered.
Inhalation of air (exposures related to soil vapor intrusion)	A monitoring program is being implemented to verify if additional actions will be needed to address exposures to soil vapor intrusion.
Direct contact and incidental ingestion of Surface water	No sources of surface water were noted on-Site or in the vicinity.

- Known and Potential Contaminant Sources and the fate and extent of contamination:
 - **Soil:** A Pesticide was found in shallow (0-2 feet) soils at elevated concentrations towards the back (eastern) portion of the Site. Heavy metals were found throughout the Site at concentrations above the UUSCOs and PGW SCOs, and at higher levels towards the front portion of the lot which will be excavated and removed as part of the redevelopment. PFOA and PFOS were identified at depths (0-2 feet and 14-16 feet) on the most northern corner of the Site.
 - **Groundwater:** Six (6) VOCs including 2- Isopropyl toluene, Benzene, Isopropyl benzene, n-Butylbenzene, n-Propyl benzene, and sec-Butylbenzene; nine (9) SVOCs including Acenaphthene, Fluoranthene, Naphthalene, Benzo(a)Anthracene, Benzo(b)Fluoranthene, Benzo(k)Fluoranthene, Bis(2-ethylhexyl) Phthalate, Chrysene, and Indeno(1,2,3-cd) Pyrene; four (4) Iron, Magnesium, Manganese, and Sodium; and two (2) PFAS (PFOA and PFOS) were all detected throughout the Site.

- **Soil Vapor:** Ten (10) VOCs including 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, Chloroform, Chloromethane, Hexane, Styrene, BTEX, PCE (Tetrachloroethene), Trichloroethene (TCE) and Carbon Tetrachloride (CTC) were detected throughout the Site.
- **Receptor Populations:**
 - **On-Site Receptors:** The Site is currently a vacant parcel enclosed with an 8-ft. high wooden construction fence. The proposed future use of the Site will consist of a new five-story (15,912.60-sq. ft.) mixed-use building with a commercial space in the cellar and 1st floor, and sixteen (16) residential units 2nd floor through 5th floor. The layout will consist of no front yard, a 38-feet paved rear yard to be utilized for off-street parking and a 14-foot 10-inch side yard to be utilized as a paved driveway. The proposed cellar depth (top of slab) for the new building will be 10-feet 4-inches bgs. No uncapped or landscaped areas are proposed as part of this redevelopment. Onsite receptors are limited to contractors, trespassers, site representatives and visitors granted access to the Site. During construction, potential on-site receptors include construction workers, site representatives, and visitors. Under proposed future conditions, potential on-site receptors include adult and child building residents, workers and visitors.
 - **Off-Site Receptors:** Potential off-site receptors within a 500-foot radius of the Site include Brooklyn Public Library, (K-12), and Happy Club Children's Centre (Day-care), PS/IS 686 Brooklyn Middle School, Gold Material Montessori School, Garden of Eden Home for Adults (Assisted living facility) and Little Scholars Day Care Centre. No hospital was identified within a 500-ft. radius of the Site. Commercial and construction workers; pedestrians; and trespassers based on the following land uses within 500-feet of the Site:
 - Municipal and Institutional Buildings – existing and future
 - Commercial Businesses – existing and future

- Residential Buildings – existing and future
- Building Construction/ Renovation – existing and future
- Pedestrians, Trespassers, Cyclists – existing and future
- Schools – existing and future
- Potential Exposure Points
 - **Current Conditions:** The front of the Site is capped with concrete and there are no potential exposure pathways from ingestion, inhalation, or dermal absorption of soil/ fill. The remainder of the Site is uncapped, and potential exposure points include inhalation, ingestion, or dermal contact with the surface soils, subsurface soils, and soil vapor that may volatilize during excavation. Groundwater is not exposed at the Site. The Site is served by the public water supply and groundwater is not used at the Site for potable supply and there is no potential for exposure. Because the Site is currently undeveloped, there is no potential for soil vapor to accumulate on Site.
 - **Construction/ Remediation Conditions:** During the remedial action, onsite workers will come into direct contact with surface and subsurface soils as a result of on-Site construction and excavation activities. On-Site construction workers potentially could ingest, inhale, or have dermal contact with exposed impacted soil and fill. Similarly, off-Site receptors could be exposed to dust and vapors from on-Site activities. Due to the depth of groundwater, direct contact with groundwater is not expected. During construction, on-Site and off-Site exposures to contaminated dust from on-Site will be addressed through the Soil/Materials Management Plan (SMMP), dust controls, and through the implementation of the Community Air-Monitoring Program (CAMP) and a Construction Health and Safety Plan (HASP).
 - **Proposed Future Conditions:** Under future remediated conditions, all soil in excess of RRSCOs will be removed. The Site will be fully capped, preventing

potential direct exposure to soil and groundwater remaining in place, and engineering controls (SSDS and SVE) will prevent any potential exposure due to inhalation by preventing soil vapor intrusion. The Site is served by the public water supply, and groundwater is not used at the Site. There are no plausible off-site pathways for oral, inhalation, or dermal exposure to contaminants derived from the Site.

- Overall Human Health Exposure Assessment
 - There are potential complete exposure pathways for the current Site condition. There are potential complete exposure pathways that require mitigation during implementation of the remedy. There are no complete exposure pathways under future conditions after the Site is developed. This assessment takes into consideration the reasonably anticipated use of the Site, which includes a residential structure, site-wide surface cover, and a subsurface vapor barrier system, sub-slab depressurization system and soil vapor extraction system for the building and the Site. Under current conditions, on-Site exposure pathways exist for those with access to the Site and trespassers. During remedial construction, on-Site and off-Site exposures to contaminated dust from historic fill material will be addressed through dust controls, and through the implementation of the Community Air Monitoring Program (CAMP), the Soil/Materials Management Plan (SMMP), and a Construction Health and Safety Plan (CHASP). Potential post-construction use of groundwater is not considered an option because groundwater in this area of New York City is not used as a potable water source. There are no surface waters near the Site that could be impacted or threatened.

2.6.2 Fish & Wildlife Remedial Impact Analysis

In accordance with DER-10, the purpose of the FWRIA is to identify actual or potential impacts to fish and wildlife resources from site contaminants of ecological concern. The Lower New York Bay is 1.15-miles southwest of the Site. An FWRIA is not required since there are no federal, state

or local natural resources, including waterways, wildlife refuges, wetlands or critical habitats of endangered or threatened species on, adjacent to, or impacted by the Site.

2.7 INTERIM REMEDIAL ACTION

No IRMs have been performed or are proposed at the Site.

2.8 REMEDIAL ACTION OBJECTIVES

Based on the results of the Remedial Investigation, the following Remedial Action Objectives (RAOs) have been identified for this Site.

2.8.1 Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater containing contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of, volatiles emanating from contaminated groundwater.

RAOs for Environmental Protection

- Remove the source of ground water contamination.

2.8.2 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of, or exposure to, contaminants volatilizing from contaminated soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater contamination.

2.8.3 Soil Vapor

Following RAOs have been identified for the Site:

- RAOs for Public Health Protection
 - Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

3.0 DESCRIPTION OF REMEDIAL ACTION PLAN

3.1 Evaluation of Remedial Alternatives

The goal of the remedy selection process is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing RAOs for media in which chemical constituents were found in exceedance of applicable standards, criteria and guidance values (SCGs). Remedial alternatives are then developed and evaluated based on the following criteria:

- Protection of human health and the environment;
- Compliance with standards, criteria, and guidelines (SCGs);
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implement ability;
- Cost effectiveness;
- Community Acceptance;
- Green and Sustainable Remediation (including climate resiliency); and
- Land use.

The following is a detailed description of the alternatives analysis and remedy selection to address impacted media at the Site. This analysis was prepared in accordance with 6 NYCRR Part 375-1.8(f) and Part 375-3.8(f) and Section 4.3(c) of NYSDEC DER-10. Three (3) remedial alternatives are evaluated, as follows:

Alternative 1:

- Selection of Track 1 cleanup.
- Removal of all soil/fill exceeding Unrestricted Use SCOs throughout the entire Site at a termination depth of 17-feet bgs or the groundwater table whichever is encountered first (Figure 4.1). Confirmation that Unrestricted Use SCOs have been achieved will be accomplished with post-excavation endpoint sampling. Approximately 5,037-cubic yards (7,556 tons) of soil/fill will be removed from the Site and properly disposed of at an appropriately licensed or permitted facility. If soil/fill containing analytes at concentrations above Unrestricted Use SCOs is still present at a termination depth of 17-feet bgs, additional excavation would be performed to ensure complete removal of soil/fill that does not meet Unrestricted Use SCOs. This would require some extraordinary support of excavation (SOE) measures to allow full sitewide excavation to the depth of 17-feet bgs and backfilling the 17-foot excavation with certified clean fill to meet the desired redevelopment depth.

Alternative 2:

- Selection of Track 2 cleanup.
- Removal of all soil/fill exceeding restricted residential Use SCOs (RRSCOs) throughout the entire Site at a termination depth of 4-feet bgs or the end-point samples compliant with Restricted Residential SCOs (Figure 4.2). Approximately 1,185-cubic yards (1,778 tons) of soil/fill will be removed from the Site and properly disposed at an appropriately licensed or permitted facility. Additional excavation will be achieved in the building (12-feet bgs) and elevator pit areas (17-feet bgs) for development purposes totaling 1,142 yds (1,714 tons) (**Figure 11**). If soil/fill containing analytes at concentrations above Restricted Residential Use SCOs is still present at the base of the proposed remedial excavation, additional excavation would be performed.
- Installation of a Sub-Slab Depressurization System (SSDS) within the building footprint and an SVE system in the rear yard.

- Long-term institutional / engineering controls are allowed to address or prevent exposures from other impacted media. A Site Management Plan would ensure that these controls remained protective for the long term.

Alternative 3:

- Selection of Track 4 cleanup.
- Removal of all soil/fill exceeding RRSCOs and confirmation that Track 4 SCOs have been achieved with post-excavation end point sampling. For remediation purposes, the top 2-feet of Sitewide soil/fill will be excavated to remove historic fill and meet the RRSCOs (Figure 4.3). Approximately 593-cubic yards (890 tons) of soil/fill will be generated during remediation excavation of historic fill. Additional excavation will be achieved in the building (12-feet bgs) and elevator pit areas (17-feet bgs) for development purposes totaling 1,142 yds (1,714 tons) (**Figure 11**). If soil/fill containing analytes at concentrations above RRSCOs is still present at the base of the excavations, additional excavation would be performed.
- This alternative would include the installation of two (2) engineering controls: an active Sub Slab Depressurization System (SSDS), and a Soil Vapor Extraction (SVE) system; and two (2) protective systems: a 20-mil or better vapor barrier (an element of construction (not an EC)) beneath the entire Site and capping with a 4-inch-thick concrete slab to prevent potential exposures from soil vapor in the future.
- Establishment of use restrictions including prohibitions on the use of groundwater from the Site; prohibitions of restricted Site use, such as farming or vegetable gardening, to prevent future exposure pathways; and prohibition of a higher level of land use without the NYSDEC approval.
- Establishment of an approved SMP to ensure long-term management of these Engineering and Institutional Controls including the performance of periodic inspections and certification that the controls are performing as they were intended. The SMP will note that the property owner and property owner's successors and assigns must comply with the approved SMP.

THRESHOLD CRITERIA

Protection of Public Health and the Environment

This criterion is an evaluation of the remedy's ability to protect public health and the environment, and an assessment of how risks posed through each existing or potential pathway of exposure are eliminated, reduced, or controlled through removal, treatment, and implementation of Engineering Controls or Institutional Controls. Protection of public health and the environment must be achieved for all approved remedial actions.

Alternative 1 would be protective of human health and environmental exposure to these constituents on-site would be eliminated by excavation and removing all historic fill soils exceeding Unrestricted Use SCO's and groundwater protection standards, disposing excavated materials off-site and backfilling as needed with certified clean fill, virgin mined materials or recycled concrete materials from a NYSDEC permitted recycling facilities thus eliminating potential for direct contact with contaminated soil/fill once construction is complete and eliminating the risk of contaminants leaching into groundwater. This Alternative would not require Engineering Controls since it is a Track 1 cleanup.

Alternative 2 would achieve comparable protections of human health and environmental exposure to these constituents on-site would be eliminated by the excavation and removal of the maximum of the historic fill at the Site and by ensuring that remaining soil/fill on-Site meets Restricted Residential SCOs, as well as installation of an SSDS within the building footprint and SVE system in the rear yard. Establishment of RRSCOs would minimize the risk of contamination leaching into groundwater and exposed to human health and environment. A Site Management Plan would ensure that these controls remained protective for the long term.

Alternative 3 would achieve comparable protections of human health and the environment by excavation and removal of 2-feet bgs Site soil/fill material and further excavation for the proposed redevelopment and by ensuring that remaining soil/fill on-Site meets RRSCOs, as well as by placement of Institutional and Engineering Controls, i.e., active SSDS within the building footprint, and SVE system in the rear yard; along with vapor barrier installation under the building and composite cover construction as protective systems (elements of construction (not ECs)).

The composite cover system would prevent direct contact with any remaining on-Site soil/fill. Implementing Engineering Controls including a SMP for the Site would ensure that the composite cover system remains intact and protective of public health. Establishment of RRSCOs would minimize the risk of contamination leaching into groundwater.

For all Alternatives, potential exposure to contaminated soils or groundwater during construction would be minimized by implementing a Construction Health and Safety Plan, an approved Soil/Materials Management Plan, and Community Air Monitoring Plan (CAMP). Potential contact with contaminated groundwater would be prevented as its use is prohibited by city laws and regulations. Potential future migration of off-Site soil vapors into the new building would be prevented by installing (as part of construction) a vapor barrier below the building slab and outside foundations walls below grade.

Compliance with Standards, Criteria and Guidance (SCGs)

This evaluation criterion assesses the ability of the alternatives to achieve applicable standards, criteria and guidance.

Alternative 1 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs for soil through removal of soil to achieve Unrestricted Use SCO's and Protection of Groundwater SCO's. Compliance with SCGs for soil vapor would also be achieved by installing (as part of construction) a vapor barrier system below the new building's cellar slab and continuing the vapor barrier outside of subgrade foundation walls, as part of development.

Alternative 2 would achieve compliance with the remedial goals, chemical-specific SCG's and RAOs for soil through removal of soil to meet Restricted Residential SCO's. Compliance with SCG's for soil vapor would also be achieved by installing an active SSDS beneath the new building footprint, a SVE system in the rear yard, and installing a vapor barrier system below the new building's cellar slab and continuing the vapor barrier outside of subgrade foundation walls (as part of construction). A Site Management Plan would ensure that the SSDS and SVE systems remained protective for the long term.

Alternative 3 would achieve compliance with the remedial goals, chemical-specific SCG's and RAOs for soil through removal of soil to meet RRSCO's. Compliance with SCG's for soil vapor would also be achieved by installing an active SSDS beneath the new building footprint, a SVE system in the rear yard, and two (2) protective systems: a site-wide vapor barrier system below the new building's cellar slab and continuing the vapor barrier outside of subgrade foundation walls and composite cover system throughout the Site (elements of construction (not ECs)). A Site Management Plan would ensure that the engineering controls remained protective for the long term.

During remedial and construction activity for any of the Alternatives, workers and area residents may be exposed to impacted soil and vapors. Worker exposure to soil and vapors will be minimized through implementation of a Site-specific Construction Health and Safety Plan. Exposures to area residents from dust and/or vapors will be minimized through the use of engineering controls and through implementation of a CAMP. Health and safety measures contained in the CHASP and CAMP will be implemented during Site redevelopment under this RAWP. For the three (3) Alternatives, focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material would be in compliance with applicable SCGs. These measures will protect on-site workers and the surrounding community from exposure to Site-related contaminants.

BALANCING CRITERIA

Short-term effectiveness and Impacts

This evaluation criterion assesses the effects of the alternative during the construction and implementation phase until remedial action objectives are met. Under this criterion, alternatives are evaluated with respect to their short-term effects during the remedial action on public health and the environment during implementation of the remedial action, including protection of the community, protection of onsite workers and environmental impacts. All three (3) alternatives have similar short-term effectiveness during their implementation, as each requires excavation of historic fill material. The alternatives would result in short-term dust generation impacts associated with excavation, handling, load out of materials, and truck traffic. Short-term impacts

could potentially be higher for Alternatives 1 and 2 since excavation of greater amounts of historical fill material would take place. However, focused attention to means and methods during a Track 1, 2 (or Track 4) removal action, including community air monitoring and appropriate truck routing, would minimize the overall impact of these activities.

An additional short-term adverse impact and risk to the community associated with all the three (3) remedial alternative is increased truck traffic. Truck traffic will be routed on the most direct course using major thoroughfares where possible and flag persons will be used to protect pedestrians at Site entrances and exits.

The potential adverse impact to the community, workers, and the environment for all the three (3) alternatives would be minimized through implementation of control plans including a Construction Health and Safety Plan, a Community Air Monitoring Plan (CAMP) and a Soil/Materials Management Plan (SMMP), during all on-Site soil disturbance activities and would minimize the release of contaminants into the environment. The alternatives provide short-term effectiveness in protecting the surrounding community by decreasing the risk of contact with on-Site contaminants. Construction workers operating under appropriate management procedures and a CHASP would provide protection from on-Site contaminants by using personal protective equipment would be worn consistent with the documented risks within the respective work zones.

Long-term effectiveness and permanence

This evaluation criterion addresses the results of a remedial action in terms of its permanence and quantity/nature of waste or residual contamination remaining at the Site after response objectives have been met, such as permanence of the remedial alternative, magnitude of remaining contamination, adequacy of controls including the adequacy and suitability of Engineering Controls/Institutional Controls (ECs/ICs) that may be used to manage contaminant residuals that remain at the Site and assessment of containment systems and ICs that are designed to eliminate exposures to contaminants, and long-term reliability of ECs.

Alternative 1 and Alternative 2 would achieve long-term effectiveness and permanence related to on-Site contamination by permanently removing all impacted soil/fill above UUSCOs and

RRSCOs. Removal of on-Site contaminant sources will also prevent future groundwater contamination.

Alternative 3 would provide long-term effectiveness by removing most on-Site contamination and attaining RRSCOs; installing two (2) engineering controls: an active SSDS beneath the new building cellar, and a SVE system in the rear yard; along with two (2) protective systems: a vapor barrier system across the entire Site and a composite cover (as part of construction); maintaining use restrictions; and establishing an SMP to ensure long-term management of ECs. The SMP would ensure long-term effectiveness of all ECs by requiring periodic inspection and certification that these controls and restrictions continue to be in place and are functioning as they were intended, assuring that protections designed into the remedy continue to provide the required level of protection.

Reduction of Toxicity, Mobility, or Volume of Contaminated Material

This evaluation criterion assesses the remedial alternative's use of remedial technologies that permanently and significantly reduce toxicity, mobility, or volume of contaminants as their principal element. The following is the hierarchy of source removal and control measures that are to be used to remediate a Site, ranked from most preferable to least preferable: removal and/or treatment, containment, elimination of exposure and treatment of source at the point of exposure. It is preferred to use treatment or removal to eliminate contaminants at a Site, reduce the total Mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce of total volume of contaminated media.

Alternatives 1 and 2 will permanently eliminate the toxicity, mobility, and volume of contaminants from on-Site soil by removing all soil in excess of Unrestricted Use and Restricted Use SCO's, respectively. Alternative 1 would remove a greater total mass of contaminants from the Site.

Alternative 3 would remove the historic fill at the Site 2-feet bgs, and all remaining on-Site soil/fill beneath the new building will meet RRSCO's.

Implement ability

This evaluation criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation, including technical feasibility of construction and operation, reliability of the selected technology, ease of undertaking remedial action, monitoring considerations, administrative feasibility (e.g., obtaining permits for remedial activities), and availability of services and materials.

The techniques, materials, and equipment to implement all three (3) alternatives are readily available and have been proven to be effective in remediating the contaminants present on the Site.

Alternative 1 does not require the use of long-term engineering or institutional controls to address impacted media or prevent exposures within the proposed building due to 20-feet bgs remedial excavation. However, **Alternatives 2 and 3** will include the installation of two (2) engineering controls, i.e., an active Sub Slab Depressurization System (SSDS), and a Soil Vapor Extraction (SVE) system; and two (2) protective systems (elements of construction (not ECs)): a 20-mil or better vapor barrier beneath the entire Site and capping with a 4-inch-thick concrete slab to prevent potential exposures from soil vapor in the future. They use standard equipment and technologies that are well established in the industry.

The reliability of each remedy is also high. There are no special difficulties associated with any of the activities proposed.

Cost Effectiveness

This evaluation criterion addresses the cost of alternatives, including capital costs (such as construction costs, equipment costs, and disposal costs, engineering expenses) and site management costs (costs incurred after remedial construction is complete) necessary to ensure the continued effectiveness of a remedial action.

Since historic fill at the Site appeared to be found to extend to a depth of up to 2-feet below grade during the RI, and the new building requires excavation excavating to 2-feet bgs for the

rear and side yards; 10-feet bgs for the proposed building cellar; 12-feet bgs for the foundation footings; and 17-feet bgs for the proposed elevator shaft.

The costs associated with Alternative 1 will be approximately \$1,500,000.00, which is significantly higher than Alternatives 2 and 3 to remove additional soils to achieve Unrestricted Use SCOs. This cost estimate includes the following elements and assumptions:

- Demolition of former building slab and paving;
- Sheeting and shoring/underpinning to allow excavation to a minimum depth of 20-feet to the lot line;
- Excavation to a depth of 17-feet across the entire Site to removal all historic fill material to meet Unrestricted Use SCOs;
- Disposal of approximately 5,037-cu.yds. (7,556 tons) of historic fill soil as non-hazardous;
- Importation of certified clean fill to meet the desired redevelopment grade; and
- HASP and CAMP monitoring for the duration of the remedial activities.

The costs associated with **Alternative 2** will be approximately \$850,000.00. This cost estimate includes the following elements and assumptions:

- Demolition of former building slab and paving;
- Sheeting and shoring/underpinning to allow excavation to a maximum depth of 4-feet to the lot line;
- Development excavation for the elevator pit to a depth of 17-feet, foundation footings, and cellar including the remainder of the lot (side yard and rear yar) to a depth of 12-feet;
- Disposal of approximately 1,185-cubic yards (1,778 tons) of historic fill soil as non-hazardous. An additional 1,143 yds (1,714 tons) of soil will be excavated for development purposes;
- Importation of certified clean fill to meet the desired redevelopment grade;

- Installation and operation of SSDS beneath the new building cellar, and SVE system beneath the rear yard; and
- HASP and CAMP monitoring for the duration of the remedial activities.

The costs associated with Alternative 3 will be approximately \$425,000.00. This cost estimate includes the following elements and assumptions:

- Demolition of former building slab and paving;
- 2-foot bgs site-wide remedial excavation followed by Support of Excavation (S.O.E.) to continue the development excavation;
- Disposal of approximately 593-cubic yards (889 tons) of historic fill soil as non-hazardous. An additional 1,578 yds (2,365 tons) of soil will be excavated for development purposes;
- Limited site backfilling with certified clean fill to meet the desired redevelopment grade;
- Installation and operation of an active Sub Slab Depressurization System (SSDS), a Soil Vapor Extraction (SVE) system; and
- HASP and CAMP monitoring for the duration of the remedial activities.

If additional soil with analytes above Restricted Residential SCOs remain after excavation for the new building, long-term costs for Alternative 3 are likely higher than Alternatives 1 and 2 based on implementation of a Site Management Plan as part of Alternative 3.

The remedial plan would couple the remedial action with the redevelopment of the Site, lowering total costs. The remedial plan will also consider the selection of the most appropriate disposal facilities to reduce transportation and disposal costs during cleanup and redevelopment of the Site.

Community Acceptance

This evaluation criterion addresses community opinion and support for remedial action. Observations here will be supplemented by public comment received on the RAWP.

This RAWP will be subject to a public review under the NYSDEC Brownfields Cleanup Program for 45-days and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedy. This public comment will be considered by NYSDEC prior to approval of this plan. The Citizen Participation Plan (CPP) for the project is provided in **Appendix C**. Observations here will be supplemented by public comment received on the RAWP. Under both alternatives, the overall goals of the remedial program, to protect public health and the environment and eliminate potential contaminant exposures, have been broadly supported by citizens in NYS communities.

Land Use

This evaluation criterion addresses the proposed use of the Site. This evaluation has considered reasonably anticipated future uses of the Site and takes into account: current use and historical and/or recent development patterns; applicable zoning laws and maps; NYS Department of State's Brownfield Opportunity Areas (BOA) pursuant to section 970-R of the general municipal law; applicable land use plans; proximity to real property currently used for residential use, and to commercial, industrial, agricultural, and/or recreational areas; environmental justice impacts, Federal or State land use designations; population growth patterns and projections; accessibility to existing infrastructure; proximity of the Site to important cultural resources and natural resources, potential vulnerability of groundwater to contamination that might emanate from the Site, proximity to flood plains, geography and geology; and current Institutional Controls applicable to the Site.

The Site is zoned as R6B/C2-3, residential district with commercial overlays. The current, intended, and reasonably anticipated future land use of the Site and its surroundings are compatible with the selected remedy of soil remediation. The proposed future use of the Site includes a new five-story (15,912.60-sq. ft.) mixed-use building with a commercial space in the cellar and 1st floor, and sixteen (16) residential units 2nd floor onwards.

Following remediation, the Site will meet a RRSCOs which is protective of public health and the environment for its planned residential use. The proposed use is compliant with the Site's zoning and is consistent with recent development patterns. The areas surrounding the Site is urban and consists of predominantly mixed-use (residential and commercial buildings) in zoning districts designated for commercial and residential uses. The development would remediate a contaminated lot and provide a modern mixed-use building. The proposed development would clean up the Site and make it safer, create new employment opportunities, and other economic benefits from land revitalization.

Temporary short-term project impacts are being mitigated through site management controls and truck traffic controls during remediation activities. Following remediation, the Site will meet RRSCOs which is protective of public health and the environmental for its planned use.

The Site is not in close proximity to important cultural resources, including federal or state historic or heritage sites or Native American religious sites, natural resources, waterways, wildlife refuges, wetlands, or critical habitats of endangered or threatened species. The Site is located in an urban area and not in proximity to fish or wildlife and neither alternative would result in any potential exposure pathways of contaminant migration affecting fish or wildlife. The remedial action is also protective of groundwater natural resources. The Site does not lie in a Federal Emergency Management Agency (FEMA)-designated flood plain. All alternatives are equally protective of natural resources and cultural resources. Improvements in the current environmental condition of the Site achieved by the three (3) alternatives considered in this plan are consistent with the City's goals for cleanup of contaminated land.

3.2 SELECTION OF THE PREFERRED REMEDY

The preferred remedy for the Site is Alternative 2, Track 2 cleanup which will meet the RRSCOs and protection to groundwater (PGW) criteria. Data generated during the Site investigation support the conclusion that Unrestricted Use SCOs for soil cannot be achieved with the proposed excavations for the building footprint at this Site.

The Alternative 2 remedy will remove all soil/fill exceeding RRSCOs 4-feet beneath the Site, which will be confirmed with post-excavation sampling. If soil/fill containing analytes at concentrations above RRSCOs is still present at the base of the excavation after removal of all soil required for construction of the new building's cellar level and slab are complete, additional excavation would be performed to ensure complete removal of soil/ fill that does not meet RRSCOs.

Engineering Controls are required for a Track 2 Cleanup. An active SSDS will be installed within the footprint of the proposed building cellar, and an SVE system in a vapor hotspot region on the northeastern corner of the Site; along with a composite cover consisting of a concrete cap to prevent potential exposures from soil vapor.

Use restrictions will be imposed on the Site (including prohibitions on any use higher than Restricted Residential, e.g., the use of groundwater from the Site; prohibitions of restricted Site use, such as farming or vegetable gardening, to prevent future exposure pathways; and prohibition of a higher level of land use without NYSDEC approval).

3.2.1 Zoning;

The Site current zoning designation is R6B; Residential District, with the Commercial overlay zoning C2-3 that allows for commercial usage. R6B zoning districts are often traditional row house districts, which preserve the scale and harmonious streetscape of neighborhoods of four-story attached buildings developed during the 19th century. Many of these houses are set back from the street with stoops and small front yards that are typical of Brooklyn's "brownstone" neighborhoods, such as Park Slope, Boerum Hill and Bedford Stuyvesant.

Districts C2-1 through C2-5 are commercial overlays mapped within residence districts. Mapped along streets that serve local retail needs, they are found extensively throughout the city's lower- and medium-density areas and occasionally in higher-density districts. The proposed use is consistent with existing zoning for the property.

The Site was part of the Bensonhurst Rezoning dated 07/27/2005. The E-Designation for Hazardous Materials, (E-145) was placed on the Site by the New York City Department of City Planning (NYCDCP) under CEQR # 05DCP055K.

3.2.2 Applicable Comprehensive Community Master Plans or Land Use Plans

Based upon review of City of New York Planning Department documents, there are no applicable comprehensive community master plans or land use plans that would impact remedy implementation.

3.2.3 Surrounding Property Uses

The surrounding property uses consist of a variety of land uses including residential and commercial. The adjoining property to the north was identified as commercial (auto repair shop), the adjoining property to the east was identified as mixed-use and commercial (Brooklyn public library-Highlawn branch), the adjoining property to the south was identified as residential, and the properties directly across Stillwell Avenue to the west was identified as residential. A gasoline station was identified on the northwest corner of Stillwell Avenue and Kings Highway. Mixed use and residential properties were identified along Kings Highway. The current, intended, and reasonably anticipated future land use of the Site and its surroundings are compatible with the selected remedy.

3.2.4 Citizen Participation

Citizen Participation during implementation of a remedial program will proceed in accordance with the Citizen Participation Plan included as **Appendix C** of this RAWP.

3.2.5 Environmental Justice

There are no known environmental justice concerns associated with this project.

3.2.6 Proximity to Natural Resources

The closest natural resources or water body is the Gravesend Bay, which is located approximately 1.05-miles southwest from the Site. There are no mapped wetlands on or in the near vicinity of the Site. Surface water runoff on the Site flows to the surrounding Streets that are connected to the NYC storm water sewer system.

3.2.7 Off-Site Groundwater Impacts

The petroleum-related compounds in the groundwater samples are attributed to the spill site located at 125 Kings Highway, approximately 150-feet north of the Site at a higher gradient, historically utilized as a gasoline/service station with four (4) on-site 4,000-gallon gasoline USTs (PBS ID 2-151378). The tanks were closed by removal on March 13, 19, and 20, 2019 (NYCDOB Job # 321905042, December 12, 2018), and the spill was recorded on March 15, 2019 (Spill # 1812287); consequent to the leaking USTs. Based on the OER documents research (OER Site # 21EHAZ037K), remediation and construction were completed and the database was last updated on July 1, 2022. The soil samples indicated no exceedances in VOCs or PCBs, however, one (1) SVOC, five (5) metals and two (2) PFAS compounds were detected. Groundwater samples indicated significant exceedances in petroleum-related compounds (BTEX) VOCs and SVOCs, two (2) metals and several PFAS compounds.

3.2.8 Proximity to Floodplains

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Number 3604970351F (effective September 2007) for the Site area was reviewed to assess whether the Site is located within a designated flood plain or flood zone. The FIRM indicated that the Site is located within Flood Zone X. Areas within Flood Zone X identified as Other Areas on the map (i.e., no hatch pattern) are determined to be outside the 0.2% annual chance or 500-year floodplain. According to the NYC Flood Hazard Mapper, the Site is not located in a mapped flood hazard zone (A, V, or X).

3.2.9 Current Institutional Controls

There are no current institutional controls associated with the Site. However, institutional control will be evaluated and implemented as appropriate as part of the Site Management Plan (SMP) development process.

3.3 SUMMARY OF SELECTED REMEDIAL ACTIONS

The remedial action outlined below aims to achieve all the remedial action goals established for the project. The proposed remedial action is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants and uses standard methods that are well established in the industry. The proposed remedial action will consist of:

1. Performance of a Special Community Air Monitoring Program (CAMP) for particulates and volatile organic carbon compounds to fulfil the special requirements for work within 20 feet of potentially exposed individuals and structures and special requirements for indoor work with co-located residences or facilities;
2. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas;
3. Utilizing Waste Characterization Study for soils generated during site redevelopment excavation activities for disposal purposes. The waste characterization soil samples were collected at a frequency dictated by the disposal facility;
4. Excavation of soil/fill exceeding RRSCOs and protection to groundwater (PGW) standards listed in **Appendix E**. For remediation purposes, the top 4-feet of Sitewide soil/fill will be excavated to meet the Restricted Residential SCOs. Approximately 1,185-cubic yards (1,778 tons) of soil/fill will be generated during remediation excavation; An additional 1,142 yds (1,714 tons) of soil will be excavated for development purposes;
5. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
6. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials;
7. Removal of all UST's that are encountered during soil/fill removal actions. Registration of tanks and reporting of any petroleum spills associated with UST's and appropriate closure of these petroleum spills in compliance with applicable local, State and Federal laws and regulations;

8. Collection and analysis of eight (8) confirmation samples at the remedial excavation depths will be used to verify that the SCOs for the site have been achieved. If confirmation sampling indicates that SCOs were not achieved at the stated remedial depth, the Applicant must notify DEC, submit the sample results and, in consultation with DEC, determine if further remedial excavation is necessary. Further excavation for development will proceed after confirmation samples demonstrate that SCOs for the site have been achieved;
9. Appropriate off-Site disposal of all material removed from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal;
10. Import of materials to be used for backfill and cover in compliance with: (1) chemical limits, and (2) all Federal, State and local rules and regulations for handling and transport of material;
11. Dewatering is anticipated during the proposed elevator shaft excavation, and will be done in compliance with city, state, and federal laws and regulations. Extracted groundwater will either be containerized for off-site licensed or permitted disposal or will be treated under the Long Island Well permit from New York City Department of Environmental Protection (NYCDEP) to meet pretreatment requirements prior to discharge to the sewer system;
12. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations;
13. Construction and maintenance of a site cover to prevent human exposure to residual contaminated soil/fill remaining under the Site consisting of:
 - a. 4-inch-thick concrete building cellar slab underlain with a 20-mil vapor barrier (Raven VaporBlock Plus VBP-20) followed by a 6 layer of $\frac{3}{4}$ -inch crushed blue stone under building footprint. A 12-inch layer of $\frac{3}{4}$ -inch crushed blue stone will be installed below the 6 inches in the SSDS trench areas, and

- b. 4-inch-thick concrete slab underlain by a 6 layer of $\frac{3}{4}$ -inch crushed blue stone under the rear parking lot and driveway areas;
- 14. As a part of the development, installation of a vapor barrier system consisting of 20-mil vapor barrier (or better) beneath the building cellar slab, footings and outside of sub-grade foundation sidewalls to mitigate soil vapor migration into the building. The vapor barrier system, which is considered a green remediation technique that may improve energy efficiency, will consist of a 20-mil Raven Industries Vapor Block Plus (VBP-20) below the slabs within the full building area. All welds, seams and penetrations will be properly sealed to prevent preferential pathways for vapor migration, and installed per the manufacturer's specifications. The remedial engineer will oversee and certify in the FER that the vapor barrier was designed and properly installed within the new building footprint;
- 15. Installation of an active sub-slab depressurization system (SSDS) consisting of a single loop of horizontal pipe set in the middle of a gas permeable layer immediately beneath the building cellar slab and vapor barrier system. The SSDS gas permeable layer will consist of a 6-inch layer of $\frac{3}{4}$ -inch crushed blue stone placed directly beneath the building cellar slab. The SSDS piping will be installed within a trench an additional 6 inches below the 6 inch permeable layer. The horizontal piping will consist of looped 4-inch slotted HDPE corrugated pipe which will be fabric wrapped and connected to a 6-inch cast iron solid riser pipe that will penetrate the foundation wall and travel along the building rear exterior wall to the roof. The riser pipe will be fitted with an inline vacuum fan (Radonaway RP265 or equal) on the roof and finished a minimum of 3-feet above the top of the parapet wall and finished with a 6-inch goose neck pipe to prevent rain infiltration. The fan is required to be at least 10 feet from any HVAC air intake and nearby windows. The Active SSDS is an Engineering Control for the remedial action that will be installed under the supervision of the remedial engineer. The remedial engineer will certify in the FER that the SSDS was designed and properly installed to establish a vacuum in the gas permeable layer and a negative (decreasing outward) pressure gradient across the entire building slab to prevent vapor migration into the building;

16. Installation of an active Soil Vapor Extraction (SVE) system within a vapor hotspot area (SV-1 & SV-2 from RI, and SV-5 from the Phase-II) as identified in the previous RI on the northeastern corner of the Site (proposed rear yard) in order to remediate chlorinated and petroleum-related VOCs found in exceedance in that area. The system will be constructed with a fabric wrapped; 4-inch slotted (0.050" slot size) PVC SVE well installed vertically at a termination depth of 12-feet bgs with a porous annulus not to exceed 8-inches diameter. The SVE annulus will be filled with ¾-inch crushed blue stone to surround the slotted piping and will be connected to a horizontal 4-inch solid PVC pipe which will run beneath site grade and perpendicular toward the rear of the building's most northeastern section and travel along the building rear exterior wall to the first-floor roof. The pipe will be fitted with an inline vacuum fan and finished 3-feet above the top of the parapet line on the first-floor roof with a Schedule-40 PVC 6-inch goose neck pipe to prevent rain infiltration. The Active SVE is Engineering Control for the remedial action that will be installed under the supervision of the remedial engineer. The remedial engineer will certify in the FER that the SVE was designed and properly installed to establish a vacuum in the vapor hotspot area;
17. Publication of a Site Management Plan for long term management of residual contamination as required by the Environmental Easement, including plans for: (1) Institutional and Engineering Controls, (2) monitoring, (3) operation and maintenance and (4) reporting;
18. All responsibilities associated with the Remedial Action, including permitting requirements and pretreatment requirements, will be addressed in accordance with all applicable Federal, State and local rules and regulations; and
19. Submission of a FER that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.

Remedial activities will be performed at the Site in accordance with this NYSDEC-approved RAWP and the NYSDEC-issued Decision Document. All deviations from the RAWP and/or Decision Document will be promptly reported to NYSDEC for approval and fully explained in the FER.

4.0 REMEDIAL ACTION PROGRAM

4.1 GOVERNING DOCUMENTS

The primary documents governing the remedial action are summarized in this section. Where referenced, copies of the full plan are provided in the appendices.

4.1.1 Standards, Criteria and Guidance (SCGs)

The following standards, criteria, and guidance are typically applicable to Remedial Action projects in New York State, and will be consulted and adhered to as applicable:

- 6 NYCRR Part 364 - NYS Waste Transporter Permits
- 6 NYCRR Part 360 - NYS Solid Waste Management Requirements
- 6 NYCRR Part 371 - Identification and Listing of Hazardous Wastes
- 6 NYCRR Part 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities
- 6 NYCRR Subpart 374-2 - Standards for the Management of Used Oil
- 6 NYCRR Part 375 - Environmental Remediation Programs
- 6 NYCRR Part 376 - Land Disposal Restrictions
- 6 NYCRR Part 613 - Petroleum Bulk Storage
- 6 NYCRR Part 661 - Tidal Wetlands - Land Use Regulations
- 6 NYCRR Part 663 - Freshwater Wetlands - Permit Requirements
- 6 NYCRR Parts 700-706 – Classes and Standards of Quality and Purity
- 6 NYCRR Part 750 - State Pollutant Discharge Elimination System (SPDES) Permits
- 29 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response
- 40 CFR Part 144 - Underground Injection Control Program
- CP-43 - Commissioner Policy on Groundwater Monitoring Well Decommissioning (December 2009)
- CP-49 – Climate Change and DEC Action (2022)
- CP-51- Soil Cleanup Guidance (2010)

- CP-60 – Screening and Assessment of Contaminated Sediment (2014)
- DER-2 - Making Changes to Selected Remedies (April 2008)
- DER-4 – Management of Coal Tar Waste & Coal Tar Contaminated Soils from Manufactured Gas Plants (2001)
- DER-10 – Technical Guidance for Site Investigation and Remediation (2010)
- DER-13 – Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York (2006)
- DER-23 – Citizen Participation Handbook for Remedial Programs (2010)
- DER-31 – Green Remediation (2010)
- DER-32 – Brownfield Cleanup Program Applications and Agreements (2017)
- DER-33 – Guide to Drafting and Recording Institutional Controls (2010)
- TAGM 3028 - "Contained In" Criteria for Environmental Media: Soil Action Levels (August 1997)
- TOGS 1.1.1 - Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations (1998, Addenda 2000, 2004 and 2023)
- TOGS 1.3.8 - New Discharges to Publicly Owned Treatment Works (1994)
- TOGS 2.1.2 - Underground Injection/Recirculation (UIR) at Groundwater Remediation Sites (1990)
- New York State Standards and Specifications for Erosion and Sediment Control (2016)
- DAR-1 (formerly Air Guide 1) - Guidelines for the Control of Toxic Ambient Air Contaminants (1997)
- U.S. EPA OSWER Directive 9200.4-17 - Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (December 1997)
- New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan
- NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (2017)

4.1.2 Site Specific Health & Safety Plan (HASP)

The Health and Safety Plan is included in **Appendix F**

Remedial work performed under this RAWP will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, such as 40-hour hazardous waste operator training and annual 8-hour refresher training. Site Safety Officer will be responsible for maintaining workers training records.

The Site Safety Coordinator will be [TBD]. A resume will be provided to NYSDEC prior to the start of remedial construction.

4.1.3 Quality Assurance Project Plan (QAPP)

A QAPP for the project is included as **Appendix D**. All field sampling procedures and analytical methods will be implemented in accordance with this QAPP.

4.1.4 Construction Quality Assurance Plan (CQAP)

The Construction Quality Assurance Plan (CQAP) describes the quality control components that will ensure that the proposed remedy accomplishes the remedial goals, remedial action objectives, and is completed in accordance with the design specifications. The CQAP will provide a detailed description of the observation and testing activities that will be used to monitor construction quality and confirm that remedy construction is in conformance with the remediation objectives and specifications. The CQAP will address the following:

- Responsibilities and authorities of the organizations and key personnel involved in the design and construction of the remedy.
- Qualifications of the quality assurance personnel that demonstrate that they possess the proper training and experience necessary to fulfill project-specific responsibilities.

- The observations and tests that will be used to monitor construction and the frequency of performance of such activities.
- The sampling activities, sample size, sample locations, frequency of testing, acceptance and rejection criteria, and plans for implementing corrective measures as addressed in the plans and specifications.
- Requirements for project coordination meetings between the Applicant and its representatives, the Construction Manager, Excavation Contractor, remedial or environmental subcontractors, and other involved parties.
- Description of the reporting requirements for quality assurance activities including such items as daily summary reports, schedule of data submissions, inspection data sheets, problem identification and corrective measures reports, evaluation reports, acceptance reports, and final documentation.
- Description of the final documentation retention provisions.

The Contractor and Construction Manager will have the primary responsibility to provide construction quality. The principal personnel who will participate in the remedial action, and implement this RAWP include the following project personnel.

Professional Engineer: Karen Tyll, P.E.

QEP/Project Manager: Dhanraj “Danny” Singh

Qualified Environmental Professional and/or his/her designee (QEP), under the direct supervision of the Professional Engineer (PE), will:

- Be on-site during remedial action to monitor particulates and organic vapor in accordance with the Health and Safety Plan (HASP). Any exceedances will be reported to the NYSDEC and NYSDOH in the daily reports.
- A QEP will meet with the Construction Superintendent on a daily basis to discuss the plans for that day and schedule upcoming activities. The QEP will document all remedial

activities in the daily report. This document will be forwarded to the Field Supervisor on a daily basis and to the PM and the RE on a weekly basis.

- A QEP will screen the excavation with a PID during intrusive activities. All readings will be noted in the record. Elevated readings will be reported to the NYSDEC and NYSDOH in the daily reports.
- A QEP will collect the excavation endpoint samples in accordance with the Plan.

4.1.5 Soil/Materials Management Plan (SMMP)

The SMMP is included in the RAWP under Section 5.4 and includes detailed plans for managing all soils/materials that are disturbed at the Site, including excavation, handling, storage, transport and disposal. It also includes all of the controls that will be applied to these efforts to assure effective, nuisance-free performance in compliance with all applicable Federal, State and local laws and regulations.

4.1.6 Storm-Water Pollution Prevention Plan (SWPPP)

To limit the potential for soil erosion and discharge, this cleanup plan has provisions for stormwater management. The main elements of the stormwater management include physical barriers such as tarp covers and erosion fencing, and a program for frequent inspection. The erosion and sediment controls will be in conformance with requirements presented in the New York State Standards and Specifications for Erosion and Sediment Control.

4.1.7 Community Air Monitoring Plan (CAMP)

Community air monitoring will be performed during this cleanup project to ensure that the community is properly protected from contaminants, dust and odors. The CAMP was prepared as part of the Site-specific HASP, which is enclosed as **Appendix F**.

4.1.8 Contractors' Site Operations Plan (SOP)

The Remedial Engineer has reviewed all plans and submittals for this remedial project (including those listed above and contractor and sub-contractor document submittals) and confirms that they comply with this RAWP. The Remedial Engineer is responsible to ensure that all later document submittals for this remedial project, including contractor and sub-contractor document submittals, comply with this RAWP. All remedial documents will be submitted to NYSDEC and NYSDOH in a timely manner and prior to the start of work.

4.1.9 Citizen Participation Plan

A certification of mailing will be sent by the Volunteer to the NYSDEC project manager following the distribution of all Fact Sheets and notices that includes: (1) certification that the Fact Sheets were mailed, (2) the date they were mailed; (3) a copy of the Fact Sheet, (4) a list of recipients (contact list); and (5) a statement that the repository was inspected on January 7, 2025 and that it contained all of applicable project documents.

No changes will be made to approved Fact Sheets authorized for release by NYSDEC without written consent of the NYSDEC. No other information, such as brochures and flyers, will be included with the Fact Sheet mailing.

The approved Citizen Participation Plan for this project is attached in **Appendix C**

Document repositories have been established at the following locations and contain all applicable project documents:

Brooklyn Public Library – Highlawn Branch

1664 West 13th Street, at Kings Highway

Brooklyn, NY 11223

Phone: 718-234-7208

Hours: 10 AM – 6 PM (Mon, Wed, Fri), 1 PM – 8 PM (Tue), 10 AM – 5 PM (Sat), Closed on Sundays

In addition, an electronic repository can be accessed via DEC Info Locator at the following link:

<https://extapps.dec.ny.gov/data/DecDocs/C224307/>

4.1.10 Green Remediation Principles

Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term.
- Reducing direct and indirect greenhouse gases and other emissions • Increasing energy efficiency and minimizing use of non-renewable energy.
- Conserving and efficiently managing resources and materials.
- Reducing waste, increasing recycling and increasing reuse of materials that will otherwise be considered a waste.
- Maximizing habitat value and creating habitat when possible.
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals.
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

Some of the Green Remediation strategies that are being proposed during this remedial action include:

- Chose a remedial alternative that will reduce the number of trucks and provide an adequate cleanup of the Site as per NYSDEC requirements.
- Reduce both water consumption and control dust during the remedial activities by direct loading soil into the disposal transport trucks. Minimize double handling of excavated materials. Less stockpiling means less dust generated as they are being made.
- Tracking the BMPs used during the Remedial action using SEFA workbooks or other methods.

4.2 GENERAL REMEDIAL CONSTRUCTION INFORMATION

4.2.1 Project Organization

Information regarding the organization/personnel and their associated responsibilities is provided below. An organization chart is included in **Figure 12**.

Resumes of key personnel involved in the Remedial Action are included in **Appendix G**.

4.2.2 Remedial Engineer

The Remedial Engineer for this project will be Karen Tyll, P.E. The Remedial Engineer is a registered professional engineer licensed by the State of New York. The Remedial Engineer will have primary direct responsibility for implementation of the remedial program for the 1665 Stillwell Avenue Site (NYSDEC Site No. C224307). The Remedial Engineer will certify in the Final Engineering Report that the remedial activities were observed by qualified environmental professionals under her supervision and that the remediation requirements set forth in the Remedial Action Work Plan and any other relevant provisions of ECL 27-1419 have been achieved in full conformance with that Plan. Other Remedial Engineer certification requirements are listed later in this RAWP.

The Remedial Engineer will coordinate the work of other contractors and subcontractors involved in all aspects of remedial construction, including soil excavation, stockpiling, characterization, removal and disposal, air monitoring, emergency spill response services, import of back fill material, and management of waste transport and disposal. The Remedial Engineer will be responsible for all appropriate communication with NYSDEC and NYSDOH.

The RE and/or designees will coordinate the work of other contractors and subcontractors involved in all aspects of remedial construction, including soil excavation, stockpiling, characterization, removal and disposal, air monitoring, emergency spill response services, import of backfill material, and management of waste transport and disposal. The RE will be responsible for all appropriate communication with NYSDEC and NYSDOH.

The Remedial Engineer will provide the certifications listed in Section 10.1 in the FER.

4.2.3 Remedial Action Construction Schedule

A remedial action schedule is discussed below in Section 10. If the schedule for remediation and development activities changes, it will be updated and submitted to NYSDEC. Currently, a three-month remediation period is anticipated.

4.2.4 Work Hours

The hours for operation of remedial construction will conform to the New York City Department of Buildings (DOB) construction code requirements or according to specific variances issued by that agency. NYSDEC will be notified by the Volunteer of any variances issued by DOB. NYSDEC reserves the right to deny alternate remedial construction hours.

4.2.5 Site Security

Site access will be controlled by a locking wooden construction fence along the boundary of the property, with entry / exit access on Stillwell Avenue. The purpose of the fencing is to limit Site access to authorized personnel, protect pedestrians from Site activities, and maintain Site security.

4.2.6 Traffic Control

Drivers of trucks leaving the Site with soil/fill will be instructed to proceed without stopping in the vicinity of the Site to prevent neighborhood impacts. The planned route on local roads for trucks leaving the site is shown on **Figure 5**.

If necessary, a flagging system will be used to protect workers, pedestrians and authorized guests. Traffic will also adhere to applicable local, state, and federal laws.

4.2.7 Contingency Plan

If an unknown source of contamination or AOC that may require remediation (USTs, stained soil, drums, etc.) is identified during the site remediation, then this soil contingency plan will be implemented.

A contingency plan is developed for the remedial construction to address the discovery of unknown structures or contaminated media during excavation. Identification of unknown contamination source areas during invasive Site work will be promptly communicated to NYSDEC's Project Manager. Petroleum spills will be reported to the NYSDEC Spill Hotline. These findings will be included in the daily report. If previously unidentified contaminant sources are found during on-Site remedial excavation or development-related excavation, sampling will be performed on contaminated source material and surrounding soils and reported to NYSDEC. Chemical analytical testing will be performed for TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs, as appropriate.

4.2.8 Worker Training and Monitoring

Worker training and monitoring will be conducted in accordance with the Site-specific CHASP, included as **Appendix F**.

4.2.9 Agency Approvals

The Volunteer has addressed all SEQRA requirements for this Site. All permits or government approvals required for remedial construction have been, or will be, obtained prior to the start of remedial construction.

The planned end use for the Site is in conformance with the current zoning for the property as determined by New York City Department of City Planning. A Certificate of Completion will not be issued for the project unless conformance with zoning designation is demonstrated.

A complete list of all federal, state and local governmental permits, certificates or other approvals or authorizations required to perform the remedial and development work will be provided to the NYSDEC prior to start of remedial activities and construction. This list includes a citation of the law, statute or code to be complied with, the originating agency, and a contact name and phone number in that agency. This list will be updated in the Final Engineering Report. Nothing in the approved RAWP or its approval by NYSDEC should be construed as an approval for this purpose.

4.2.10 NYSDEC BCP Signage

Signs are optional for BCP sites and will be discussed with the NYSDEC Project Manager. If a sign is to be displayed, it will be erected at the main entrance to the Site prior to the start of any remedial activities. The sign will indicate that the project is being performed under the New York State Brownfield Cleanup Program. The sign will meet the detailed specifications provided by the NYSDEC Project Manager.

4.2.11 Pre-Construction Meeting with NYSDEC

A pre-construction meeting will be held between the NYSDEC, Volunteer, Remedial Environmental team, Construction Manager, and Contractor to discuss project roles, responsibilities, and expectations associated with the RAWP, and remedial process prior to the start of remedial construction activities. No remedial action work on Site should commence until after this meeting is held.

4.2.12 Emergency Contact Information

An emergency contact sheet with names and phone numbers is included in the HASP which will be updated as necessary throughout the project. That document will define the specific project contacts for use by NYSDEC and NYSDOH in the case of a day or night emergency.

4.2.13 Remedial Action Costs

The total estimated cost of the Remedial Action is \$850,000.00. This will be revised based on actual costs and submitted as an Appendix to the Final Engineering Report.

4.3 SITE PREPARATION

4.3.1 Mobilization

Mobilization will be conducted as necessary for each phase of work at the Site. Prior to commencing the remedial excavation, the Remediation Contractor will mobilize to the Site and

prepare for remedial activities. Descriptions of some of the mobilization and Site preparation activities may include the following:

- Construction of fencing and barriers;
- Utility and subsurface structures locating and marking;
- Setup of construction equipment and facilities;
- Construction of erosion and sediment control measures; and
- Construction of a decontamination and staging area.

4.3.2 Monitoring Well / Vapor Probe Decommissioning

Existing groundwater monitoring wells will either be protected during remediation and development for use in post-remedial monitoring or will be properly decommissioned in accordance with NYSDEC Commissioners Policy CP-43. The only exception to this is if the full length of the well is to be excavated during remediation.

Similarly, existing soil vapor probes will be properly decommissioned unless they are to be fully removed during remediation or used for post-remedial monitoring.

4.3.3 Erosion and Sedimentation Controls

Erosion and sediment controls will be implemented as required throughout remedy implementation and post remedial inspection and monitoring.

4.3.4 Stabilized Construction Entrance(s)

Steps will be taken to ensure that trucks departing the site will not Track soil, fill or debris off-Site. Such actions may include use of cleaned asphalt or concrete pads or use of stone or other aggregate-based egress paths between the truck inspection station and the property exit. Measures will be taken to ensure that adjacent roadways will be kept clean of project related soils, fill and debris.

4.3.5 Utility Marker and Easements Layout

The Volunteer and its contractors are solely responsible for the identification of utilities that might be affected by work under the RAWP and implementation of all required, appropriate, or necessary health and safety measures during performance of work under this RAWP. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this RAWP. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals pertinent to such work that may be required to perform work under this RAWP. Approval of this RAWP by NYSDEC does not constitute satisfaction of these requirements.

4.3.6 Sheet piling and Shoring

A Support of Excavation (SOE), which may consist of sheet pile walls will be installed to support the excavation of the contaminated fill. Appropriate management of structural stability of on-Site or off-Site structures during on-Site activities include excavation is the sole responsibility of the Volunteer and its contractors. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals that may be required to perform work under this Plan. Further, the Volunteer and its contractors are solely responsible for the implementation of all required, appropriate, or necessary health and safety measures during performance of work under the approved Plan.

4.3.7 Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations. Equipment and material staging areas are expected to be relocated throughout the Site during remedial construction.

4.3.8 Decontamination Area

A decontamination area is not required, however, all equipment will be decontaminated and demobilized at the completion of all field activities.

4.3.9 Site Fencing

The Site perimeter will be secured by a lockable wooden construction fence and gates, with entry/exit access on Stillwell Avenue. The purpose of the fencing is to limit site access to authorized personnel, protect pedestrians from site activities, and maintain site security.

4.3.10 Demobilization

The Demobilization will should address:

- Restoration of areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management area, and access area);
- Removal of temporary access areas (whether on-Site or off-Site) and restoration of disturbed access areas to pre-remediation conditions;
- Removal of sediment and erosion control measures and disposal of materials in accordance with acceptable rules and regulations;
- Equipment decontamination; and
- General refuse disposal.

Equipment will be decontaminated and demobilized at the completion of all field activities. Investigation equipment and large equipment (e.g., soil excavators) will be washed at the truck inspection station as necessary. In addition, all investigation and remediation derived waste will be appropriately disposed.

4.4 REPORTING

All daily and monthly Reports will be included in the Final Engineering Report.

4.4.1 Daily Reports

Daily reports will be submitted to NYSDEC and NYSDOH Project Managers by the end of each day following the reporting period and will include:

- An update of progress made during the reporting day;
- Locations of work and quantities of material imported and exported from the Site;
- References to alpha-numeric map for Site activities;
- A summary of any and all complaints with relevant details (names, phone numbers);
- A summary of CAMP finding, including excursions; and
- An explanation of notable Site conditions.

Daily reports are not intended to be the mode of communication for notification to the NYSDEC of emergencies (accident, spill), requests for changes to the RAWP or other sensitive or time critical information. However, such conditions must also be included in the daily reports. Emergency conditions and changes to the RAWP will be addressed directly to NYSDEC Project Manager via personal communication.

Daily Reports will include a description of daily activities keyed to an alpha-numeric map for the Site that identifies work areas. These reports will include a summary of air sampling results, odor and dust problems and corrective actions, and all complaints received from the public.

A Site map that shows a predefined alpha-numeric grid for use in identifying locations described in reports submitted to NYSDEC is attached in **Figure 2**.

The NYSDEC assigned project number will appear on all reports.

4.4.2 Monthly Reports

Monthly reports will be submitted to NYSDEC and NYSDOH Project Managers within one week following the end of the month of the reporting period and will include:

- Activities relative to the Site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (i.e. tons of material exported and imported, etc.);
- Description of approved activity modifications, including changes of work scope and/or schedule;

- Sampling results received following internal data review and validation, as applicable;
- An update of the remedial schedule including the percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays; and
- Tracking of GSR metrics determined during the design process should be included in monthly reports.

4.4.3 Other Reporting

Photographs will be taken of all remedial activities and submitted to NYSDEC in digital (JPEG) format. Photos will illustrate all remedial program elements and will be of acceptable quality. Representative photos of the Site prior to any Remedial Actions will be provided. Representative photos will be provided of each contaminant source, source area and Site structures before, during and after remediation. Photos will be included in the daily reports as needed, and a comprehensive collection of photos will be included in the Final Engineering Report.

Progress with respect to green and sustainable remediation metrics will be Tracked during implementation of the remedial action and reported in the Final Engineering Report (FER), including a comparison to the goals established during the remedial program. Regular updates to the metrics used (SEFA, SiteWise™ or otherwise approved method) should be included.

Job-site record keeping for all remedial work will be appropriately documented. These records will be maintained on-Site at all times during the project and be available for inspection by NYSDEC and NYSDOH staff.

4.4.4 Complaint Management Plan

All complaints from citizens will be promptly reported to NYSDEC. Complaints will be addressed and outcomes will also be reported to NYSDEC in daily reports. Notices to NYSDEC will include the nature of the complaint, the party providing the complaint, and the actions taken to resolve any problems.

4.4.5 Deviations from the Remedial Action Work Plan

Any deviations from the RAWP will be coordinated with the NYSDEC in advance. Notification will be provided to the NYSDEC by telephone/email for conditions requiring immediate action (e.g., conditions judged to be a danger to the surrounding community). In the event of any deviations, the following will be noted:

- Reasons for deviating from the approved RAWP;
- Approval process to be followed for changes/editions to the RAWP; and
- Effect of the deviations on overall remedy.

5.0 REMEDIAL ACTION: MATERIAL REMOVAL FROM SITE

5.1 SOIL CLEANUP OBJECTIVES

The Soil Cleanup Objectives for this Site are listed in **Appendix E**. Soil and materials management on-Site and off-Site will be conducted in accordance with the Soil Management Plan as described below.

Tables 3 through Table 9 of the RIR by RSK summarizes all soil samples that exceed the SCOs proposed for this Remedial Action. A spider map that shows all soil samples that exceed the SCOs proposed for this Remedial Action is shown in Figure 3A of the RIR by RSK.

UST closures will, at a minimum, conform to criteria defined in DER-10.

5.2 REMEDIAL PERFORMANCE EVALUATION (POST EXCAVATION END-POINT SAMPLING)

5.2.1 End-Point Sampling Frequency

Removal actions for development purposes under this plan will be performed in conjunction with confirmation endpoint soil sampling. Eight (8) endpoint samples (EP-1 through EP-8) will be collected (see a copy of Endpoint Sampling Location Plan attached as **Figure 6**) to evaluate attainment of RRSCOs, and confirm the removal of soil/fill exceeding PGW SCOs.

1. For excavations less than 20-feet in total perimeter, at least one bottom sample and one sidewall sample biased in the direction of surface runoff.
2. For excavations 20-feet to 300-feet in perimeter:
 - For surface removals, one sample from the top of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900-sq. ft. of bottom area.
 - For subsurface removals, one sample from the excavation bottom for every 900-sq. ft. of bottom area.

3. For sampling of volatile organics, bottom samples will be taken within 24 hours of excavation, and will be taken from the zero to six-inch interval at the excavation floor. Samples taken after 24 hours will be taken at six to twelve inches.
4. For contaminated soil removal, post remediation soil samples for laboratory analysis will be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to bullets 1-3 above.

Post-remediation end-point sample locations and depth will be biased towards the areas and depths of highest contamination identified during previous sampling episodes unless field indicators such as field instrument measurements or visual contamination identified during the remedial action indicate that other locations and depths may be more heavily contaminated. In all cases, post-remediation samples will be biased toward locations and depths of the highest expected contamination.

If either LNAPL and/or DNAPL are detected, appropriate samples will be collected for characterization and “fingerprint analysis” and required regulatory reporting (i.e., spills hotline) will be performed.

Endpoint samples will be analyzed for compounds and elements as described below utilizing the following methodology:

- Volatile organic compounds by EPA Method 8260;
- Semi-volatile organic compounds by EPA Method 8270;
- Pesticides/PCBs by EPA Method 8081/8082; and
- Target Analyte List metals.

New York State ELAP certified labs will be used for all endpoint sample analyses. Labs performing endpoint sample analyses will be reported in the FER. The FER will provide a tabular and map summary of all endpoint sample results and will include all data including non-detects and applicable standards and/or guidance values.

In the event the soil samples exceed RRSCOs and PGW SCOs, further excavation will take place, and five (5) post-excavation confirmatory samples will be collected post excavation to meet RRSCOs and PGW standards.

5.2.2 Methodology

End-point samples will be collected from the sidewalls and base of the remedial excavation at any hotspot locations identified in the Remedial Investigation, in accordance with NYSDEC DER-10. End-point samples will be analyzed for SCO trigger parameters.

Post-remediation end-point sample locations and depth will be biased towards the areas and depths of highest contamination identified during previous sampling episodes unless field indicators such as field instrument measurements or visual contamination identified during the remedial action indicate that other locations and depths may be more heavily contaminated. In all cases, post-remediation samples should be biased toward locations and depths of the highest expected contamination.

5.2.3 Reporting of Results

The analytical results of the end-point samples will be tabulated and compared to the RRSCOs. The tabulated data as well as the laboratory reports will be included in the FER. The samples will be submitted to a New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) certified laboratory. The results will be reported in accordance with the NYSDEC requirements for Category B data deliverables as outlined in DER-10.

5.2.4 QA/QC

QA/QC procedures will be used to provide performance information with regard to accuracy, precision, sensitivity, representation, completeness, and comparability associated with the sampling and analysis for this investigation. Field QA/QC procedures will be used (1) to document that samples are representative of actual conditions at the Site and (2) identify possible cross-contamination from field activities or sample transit. Laboratory QA/QC procedures and analyses will be used to demonstrate whether analytical results have been biased either by interfering

compounds in the sample matrix, or by laboratory techniques that may have introduced systematic or random errors to the analytical process. A summary of the field and laboratory QA/QC procedures is provided below.

Field QA/QC will include the following procedures:

- Calibration of field equipment, including PID, on a daily basis;
- Use of dedicated and/or disposable field sampling equipment;
- Proper sample handling and preservation;
- Proper sample chain of custody documentation; and
- Completion of report logs.

The above procedures will be executed as follows:

- Two duplicate samples (one soil and one groundwater sample) will be collected to evaluate field sampling precision or reproducibility of measurements of the same parameter under the given set of conditions;
- Disposable sampling equipment, including acetate sleeves, latex gloves, and disposable bailers (or sample tubing), will be used to minimize cross-contamination between samples;
- For each of the parameters analyzed, a sufficient sample volume will be collected to adhere to the specific analytical protocol, and provide sufficient sample for reanalysis if necessary;
- Because plasticizers and other organic compounds inherent in plastic containers may contaminate samples requiring organic analysis, samples will be collected in glass containers, with the exception of the nitrate-preserved groundwater sample for metals analysis; and
- Appropriate sample preservation techniques, including cold temperature storage at 4° C, will be utilized to ensure that the analytical parameters concentrations do not change between the time of sample collection and analysis.

Samples will be analyzed prior to the expiration of the respective holding time for each analytical parameter to ensure the integrity of the analytical results.

5.2.5 Data Usability Summary Reports (DUSRs)

ASP Category B deliverables will be prepared for all remedial performance samples collected during implementation of this RAWP. Data Usability Summary Reports (DUSR) will be prepared by a qualified data validator and the findings will be reported in the FER.

5.2.6 Reporting of End-Point Data in FER

New York State ELAP certified labs will be used for all confirmation and end-point sample analyses and contingency sampling. Labs performing confirmation and end-point sample analyses will be reported in the FER. The FER will provide a tabular and map summary of all confirmation and end-point sample results and will include all data including non-detects and applicable standards and/or guidance values.

5.3 ESTIMATED MATERIAL REMOVAL QUANTITIES

The estimated quantity of soil/fill to be removed from the Site is 1,185 cubic yards (1,778-tons). An additional 1,142 yds (1,714-tons) of soil/fill will be excavated for development purposes. The location of planned excavations is shown in **Figure 4.3**.

All impacted soil/fill or other waste excavated and removed from the Site will be managed as regulated material and will be disposed in accordance with applicable laws and regulations. Historic fill and contaminated soils taken off-Site will be handled as solid waste and will not be disposed at a Part 360-16 Registration Facility (also known as a Soil Recycling Facility).

Waste characterization will be performed for off-Site disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported in the final remedial report. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the final remedial report. Hazardous wastes derived from on-Site will be stored, transported, and disposed of in compliance with applicable laws and regulations.

If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e., clean soil removed for development purposes), including transport to a Part 360-16 Registration Facility, a formal request will be made for approval by NYSDEC with an associated plan compliant with 6NYCRR Part 360-16. This request and plan will include the location, volume and a description of the material to be recycled, including verification that the material is not impacted by site uses and that the material complies with receipt requirements for recycling under 6NYCRR Part 360. This material will be appropriately handled on-Site to prevent mixing with impacted material

The Final Engineering Report will include an itemized account of the destination of all material removed from the Site during this remedial action. Documentation associated with disposal of all material will include records and approvals for receipt of the material. This information will be presented in the FER.

5.4 SOIL/MATERIALS MANAGEMENT PLAN

Soil and materials management on-Site and off-Site, including excavation, handling and disposal, will be conducted in accordance with the Soil/Materials Management Plan. Approximately 3,492-tons of soil material may be required to be excavated during the remedial construction and disposed of offsite. Any required fill material will meet NYSDEC-approved backfill and cover soil quality objectives for this Site. Imported soils will not exceed groundwater protection standards established in Part 375. Imported soils for Track 1 cleanup remedial action projects will not exceed UUSCOs.

5.4.1 Soil Screening Methods

Visual, olfactory and PID soil screening and assessment will be performed by a qualified environmental professional or experienced field geologist under the direction of the Remedial Engineer during all remedial and development excavations into known or potentially contaminated material. Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during the remedy and during development phase, such as excavations for foundations and utility work, prior to issuance of the COC.

All primary contaminant sources (including but not limited to tanks and hotspots) identified during Site Characterization, Remedial Investigation, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. This information will be provided on maps in the Final Engineering Report.

Screening will be performed by qualified environmental professionals. Resumes will be provided for all personnel responsible for field screening (i.e. those representing the Remedial Engineer) of invasive work for unknown contaminant sources during remediation and development work.

5.4.2 Stockpile Methods

Excavated soil from suspected areas of contamination (e.g., hot spots, USTs, drains, etc.) will be stockpiled separately and will be segregated from clean soil and construction materials. Stockpiles will be used only when necessary and will be removed as soon as practicable. While stockpiles are in place, they will be inspected daily, and before and after every storm event. Excavated soils will be stockpiled on, at minimum, double layers of 8-mil minimum sheeting, will be kept covered at all times with appropriately anchored plastic tarps, and will be routinely inspected. Soil stockpile areas will be appropriately graded to control run-off in accordance with applicable laws and regulations. Stockpiles of excavated soils and other materials shall be located at least of 50-feet from the property boundaries, where possible.

Soil stockpiles will be continuously encircled with silt fences. Hay bales will be used as needed near catch basins, surface waters and other discharge points. A dedicated water truck equipped with a water cannon will be available on-Site for dust control.

5.4.3 Materials Excavation and Load Out

The Remedial Engineer or a qualified environmental professional under his/her supervision will oversee all invasive work and the excavation and load-out of all excavated material. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the Site will be investigated by the Remedial Engineer prior to the start of Remedial Activities.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

Vehicles leaving the Site will not be overloaded. The Remedial Engineer's representative will make reasonable efforts to ensure that vehicles are not loaded beyond their NYSDOT weight rating and that all material is secured beneath the truck bed cover.

A truck wash will be operated on-Site. The Remedial Engineer will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the remedial construction is complete. Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-Site sediment Tracking.

The Remedial Engineer will be responsible for ensuring that all egress points for truck and equipment transport from the Site will be clean of dirt and other materials derived from the Site during Site remediation and development. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

The Volunteer and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are completely responsible for the safe performance of all invasive work, the structural integrity of excavations, and for structures that may be affected by excavations (such as building foundations and bridge footings).

The Remedial Engineer will ensure that Site development activities will not interfere with, or otherwise impair or compromise, remedial activities proposed in this Remedial Action Work Plan. Each hotspot and structure to be remediated (USTs, vaults and associated piping, transformers, etc.) will be removed and end-point remedial performance sampling completed before excavations related to Site development commence proximal to the hotspot or structure.

Development-related grading cuts and fills will not be performed without NYSDEC approval and will not interfere with, or otherwise impair or compromise, the performance of remediation

required by this plan. Mechanical processing of historical fill and contaminated soil on-Site is prohibited.

All primary contaminant sources (including but not limited to tanks and hotspots) identified during Site Characterization, Remedial Investigation, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. The survey information will be shown on maps to be reported in the Final Engineering Report.

5.4.4 Materials Transport Off-Site

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Truck transport routes are as follows: Stillwell Avenue to Kings Highway, to 78th street, then New Utrecht Avenue, Bay Ridge Parkway, to the Brooklyn/Queens Expressway (BQE) south to the Verrazano Bridge. All trucks loaded with Site materials will exit the vicinity of the Site using only these approved truck routes.

Proposed in-bound and out-bound truck routes to the Site are shown in **Figure 5**. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport; (g) community input (where necessary).

Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site. Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development. Queuing of trucks will be performed on-Site in order to minimize off-Site disturbance. Off-Site queuing will be prohibited.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

5.4.5 Materials Disposal Off-Site

Disposal locations will be established at a later date will be reported to the NYSDEC Project Manager.

Based on the Remedial Investigation, the total quantity of material expected to be disposed off-Site is 2,328-cubic yards (3,492-tons).

All soil/fill/solid waste excavated and removed from the Site will be treated as contaminated and regulated material and will be disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to NYSDEC's Project Manager. Unregulated off-Site management of materials from this Site is prohibited without formal NYSDEC approval.

The following documentation will be obtained and reported by the Remedial Engineer for each disposal facility used in this project to fully demonstrate and document that the disposal of material derived from the Site conforms with all applicable laws: (1) a letter from the Remedial Engineer or BCP Volunteer to the receiving facility describing the material to be disposed and requesting formal written acceptance of the material. This letter will state that material to be disposed is contaminated material generated at an environmental remediation Site in New York State. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported (including Site Characterization data); and (2) a letter from all receiving facilities stating it is in receipt of the correspondence (above) and is approved to accept the material. These documents will be included in the FER.

Non-hazardous historic fill and contaminated soils taken off-Site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360.2. The Remedial Engineer is responsible for assuring material is properly characterized and determining the appropriate disposal methods based on the characterization results.

Historical fill and contaminated soils from the Site are prohibited from being disposed at Part 360.15 Registration Facilities (also known as Soil Recycling Facilities).

Soils that are contaminated but non-hazardous and are being removed from the Site are considered by the Division of Materials Management (DMM) in NYSDEC to be Construction and Demolition (C/D) materials with contamination not typical of virgin soils. These soils may be sent to a permitted Part 360 landfill. They may be sent to a permitted C/D processing facility without permit modifications only upon prior notification of NYSDEC Region 2 DMM. This material is prohibited from being sent or redirected to a Part 360-15 Registration Facility. In this case, as dictated by DMM, special procedures will include, at a minimum, a letter to the C/D facility that provides a detailed explanation that the material is derived from a DER remediation Site, that the soil material is contaminated and that it must not be redirected to on-Site or off-Site Soil Recycling Facilities. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported.

The Final Engineering Report will include an accounting of the destination of all material removed from the Site during this Remedial Action, including excavated soil, contaminated soil, historic fill, solid waste, and hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. This information will also be presented in a tabular form in the FER.

Bill of Lading system or equivalent will be used for off-Site movement of non-hazardous wastes and contaminated soils. This information will be reported in the Final Engineering Report.

Hazardous wastes derived from on-Site will be stored, transported, and disposed of in full compliance with applicable local, State, and Federal regulations.

Appropriately licensed haulers will be used for material removed from this Site and will be in full compliance with all applicable local, State and Federal regulations.

Waste characterization sampling will be performed exclusively for the purposes of off-Site soil disposal in a manner suitable to receiving facilities and in conformance with applicable federal, state and local laws rules and regulations and facility-specific permits. Sampling and analytical

methods, sampling frequency, analytical results and QA/QC associated with waste characterization activities will be reported in the FER. All data available for soil/material to be disposed at a given facility must be submitted to the disposal facility with suitable explanation prior to shipment and receipt. Waste characterization data will be used solely for complying with requirements for off-site disposal.

5.4.6 Materials Reuse On-Site

Soil reuse is not planned for this project. In the event any site soils are reused, a “Request to Import/Reuse Fill Material” form will be filed with the NYSDEC project manager for review and approval prior to material reuse on the site.

Concrete crushing or processing on-Site is prohibited, unless NYSDEC has specifically approved on-site processing and reuse of acceptable demolition material.

Contaminated on-Site material, including historic fill and contaminated soil, removed for grading or other purposes will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines. This will be expressed in the final Site Management Plan.

5.4.7 Fluids Management

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Liquids discharged into the New York City sewer system will be addressed through approval by NYCDEP.

Dewatered fluids will not be recharged back to the land surface or subsurface of the Site. Dewatering fluids will be managed off-Site.

Discharge of water generated during remedial construction to surface waters (i.e. a local pond, stream, river and/or storm sewer) is prohibited without a SPDES and NYCDEP Discharge permit.

5.4.8 Demarcation

After the completion of soil removal and any other invasive remedial activities and prior to backfilling, a land survey will be performed by a New York State licensed surveyor. The survey

will define the top elevation of residual contaminated soils. A physical demarcation layer, consisting of orange snow fencing material or equivalent material will be placed on this surface to provide a visual reference. This demarcation layer will constitute the top of the 'Residuals Management Zone', the zone that requires adherence to special conditions for disturbance of contaminated residual soils defined in the Site Management Plan. The survey will measure the grade covered by the demarcation layer before the placement of cover soils, pavement and sub-soils, structures, or other materials. This survey and the demarcation layer placed on this grade surface will constitute the physical and written record of the upper surface of the 'Residuals Management Zone' in the Site Management Plan. A map showing the survey results will be included in the Final Engineering Report and the Site Management Plan.

5.4.9 Backfill from Off-Site Sources

All materials proposed for import onto the Site will be approved by the NYSDEC and the Remedial Engineer and will be in compliance with provisions in this RAWP prior to receipt at the Site. Additionally, materials brought to the Site will be in accordance with DER-10 5.4(e) and will meet the requirements of NYCRR 375-6.7(d).

Material from industrial sites, spill sites, other environmental remediation sites or other potentially contaminated sites will not be imported to the Site. Solid waste will not be imported onto the Site.

The Final Engineering Report will include the following certification by the Remedial Engineer: "I certify that all import of soils from off-Site, including source evaluation, approval and sampling, has been performed in a manner that is consistent with the methodology defined in the Remedial Action Work Plan".

All imported soils will meet NYSDEC approved backfill or cover soil quality objectives for this Site. These NYSDEC approved backfill or cover soil quality objectives are the lower of the protection of groundwater or the protection of public health soil cleanup objectives for the site's specific use as set forth in Table 375-6.8(b) of 6 NYCRR Part 37. Non-compliant soils will not be imported

onto the Site without prior approval by NYSDEC. Nothing in the approved Remedial Action Work Plan or its approval by NYSDEC should be construed as an approval for this purpose.

Soils that meet 'general or exempt fill' requirements under 6 NYCRR Part 360.13, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Nothing in this Remedial Action Work Plan should be construed as an approval for this purpose.

5.4.10 Stormwater Pollution Prevention

Applicable laws and regulations pertaining to stormwater pollution prevention will be addressed during the remedial program. Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the RAWP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Silt fencing or hay bales will be installed around the entire perimeter of the remedial construction area.

5.4.11 Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during on-Site remedial excavation or development related construction, sampling will be performed on product, sediment and surrounding soils, etc. Chemical analytical work will be for full scan

parameters (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides, PCBs and PFAS). Analyses will not be otherwise limited without NYSDEC approval.

Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. These findings will be also included in daily and periodic electronic media reports.

5.4.12 Community Air Monitoring Plan

Real-time air monitoring for volatile organic compounds (VOCs) and particulate levels at the perimeter of the exclusion zone or work area will be performed. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Periodic monitoring during sample collection, for instance, will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence. Exceedances of action levels observed during performance of the Community Air Monitoring Plan (CAMP) will be included in the Daily Report and reported to the NYSDEC Project Manager and NYSDOH Project Manager.

A Special Community Monitoring Plan is put in place for this Site to fulfil the special requirements for work within 20-feet of potentially exposed individuals and structures and special requirements for indoor work with co-located residences or facilities as per the following:

- Special Requirements for work within 20-feet of potentially exposed individuals and structures: As the Site is within 20-feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates will reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices are considered to prevent exposures related to the work activities and to control dust and odors. Consideration is given to implementing the planned activities during weekends or evening hours in non-residential settings, when the potentially exposed populations are at a minimum.
 - If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring will occur within the occupied structure(s). Depending upon the nature of contamination, chemical-specific colorimetric tubes of sufficient sensitivity may be necessary for comparing the exposure point concentrations with appropriate pre-determined response levels (response actions will also be pre-determined). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings will be discussed with NYSDOH prior to commencement of the work.
 - If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m³, work activities will be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m³ or less at the monitoring point.
 - Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions will be pre-determined, as necessary, for each site.
- Special Requirements for Indoor Work with Co-Located Residences or Facilities: Unless a self-contained, negative-pressure enclosure with proper emission controls will

encompass the work area, all individuals not directly involved with the planned work will be absent from the room in which the work will occur. Monitoring requirements will be as stated above under “Special Requirements for Work Within 20-feet of Potentially Exposed Individuals or Structures” except that in this instance “nearby/occupied structures” would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings, conduits, etc.) relative to adjoining rooms, will be understood and the monitoring locations established accordingly. In these situations, as recommended, the exhaust fans or other engineering controls will be used to create negative air pressure within the work area during remedial activities. Additionally, the planned work will be implemented during hours (e.g., weekends or evenings) when building occupancy is at a minimum.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Similarly, upwind concentrations will also be monitored continuously during all ground intrusive work. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities

will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200-feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20-feet, is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shut down.

All 15-minute readings must be recorded and be available for DEC personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration will be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m³) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m³ above the upwind level and provided that no visible dust is migrating from the work area.

If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m³ above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls

are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m³ of the upwind level and in preventing visible dust migration

Exceedances observed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers and included in the Daily Report.

5.4.13 Odor, Dust and Nuisance Control Plan

The Final Engineering Report will include the following certification by the Remedial Engineer: “I certify that all invasive work during the remediation and all invasive development work were conducted in accordance with dust and odor suppression methodology defined in the Remedial Action Work Plan.”

5.4.13.1 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors off-Site. Specific odor control methods to be used on a routine basis will include (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) use of foams to cover exposed odorous soils. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of all other complaints about the project. Implementation of all odor controls, including the halt of work, will be the responsibility of the Remedial Engineer, who is responsible for certifying the Final Engineering Report.

If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-Site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

Where odor nuisances have developed during remedial work and cannot be corrected, or where the release of nuisance odors cannot otherwise be avoided due to on-Site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering excavation and

handling areas under tented containment structures equipped with appropriate air venting/filtering systems.

5.4.13.2 Dust Control Plan

A dust suppression plan that addresses dust management during invasive on-Site work, will include, at a minimum, the items listed below:

- Water will be available on-site at suitable supply and pressure for use in dust control.]
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-Site roads will be limited in total area to minimize the area required for water spraying.

5.4.13.3 Other Nuisances

A plan for rodent control will be developed and utilized by the contractor prior to and during Site clearing and Site grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work and will conform, at a minimum, to NYCDEP noise control standards.

6.0 RESIDUAL CONTAMINATION TO REMAIN ON-SITE

RESIDUAL contaminated soil vapor is not expected to exist beneath the Site after the remedy is complete, and Engineering and Institutional Controls (ECs and ICs) will be installed to protect human health and the environment. These ECs and ICs are described hereafter. Long-term management of EC/ICs and of residual contamination will be executed under a Site-specific Site Management Plan (SMP) that will be developed and included in the FER.

ECs will be implemented to protect public health and the environment by appropriately managing residual contamination. The Controlled Property (the Site) will have three (3) primary EC systems. These are: (1) Composite Cover, (2) Active Sub-Slab Depressurization System, and (3) Soil Vapor Extraction System.

The FER will report residual contamination on the Site in tabular and map form. This will include presentation of exceedances of both UUSCOs and RRSCOs.

7.0 ENGINEERING CONTROLS: COMPOSITE COVER SYSTEM

Exposure to residual contaminated soils will be prevented by an engineered, composite cover system that will be built on the Site. To incorporate green remediation principles and techniques to the extent feasible in the development at this site, the building will include as an element of construction (not an EC) a minimum 20-mil vapor barrier membrane on and under the foundation, which may improve energy efficiency. Proposed development plans are provided in Appendix A.

The cover will consist of the structures such as buildings, pavement, and sidewalks comprising the Site development. This composite cover system will be comprised of 4-inches of reinforced concrete cellar slab underlain by a 20-mil vapor barrier (an element of construction (not an EC)) and 6-inches of $\frac{3}{4}$ -inch imported crushed stone to be placed beneath the entire proposed building footprint, and 4-inches of reinforced concrete slab underlain by 8-inches of $\frac{3}{4}$ -inch imported crushed stone and 1 to 1.5-ft. of certified clean fill for the proposed rear and side yard.

A diagram showing the cover type locations are shown as **Figure 8** and the design detail for each cover type is shown in **Figure 8**.

An Excavation Plan will be included in the Site Management Plan and will outline the procedures to be followed if the site cover system and underlying residual contamination are disturbed after the Remedial Action is complete.

The components of the site cover system will be documented in the FER. Maintenance of this site cover system will be described in the SMP.

8.0 ENGINEERING CONTROLS: TREATMENT SYSTEMS

Engineering Controls will be employed in the remedial action to address residual contamination remaining at the Site. The Site has two (2) primary Engineering Control Systems. These are:

- (1) Active Sub-Slab Depressurization System
- (2) Soil Vapor Extraction System

SUB-SLAB DEPRESSURIZATION SYSTEM

Migration of soil vapor into the building will be mitigated with the construction of an active Sub-Slab Depressurization System (SSDS). The SSDS will consist of a single loop of horizontal pipe set in the middle of a 6-inch gas permeable layer immediately beneath the building cellar slab and vapor barrier system (an element of construction (not an EC)). The gas permeable layer will be constructed using ¾-inch crushed blue stone placed directly beneath the building cellar slab. The horizontal piping will consist of fabric wrapped, perforated 4-inch diameter corrugated HDPE pipe manifolded to a schedule-40 6-inch solid cast iron riser pipe that penetrates the most northeastern section foundation wall and travels along the building rear exterior wall to the first-floor roof. The riser pipe will be equipped with an inline vacuum fan and finished at 6.5-feet above the top of the first-floor roof with a 6-inch goose neck pipe to prevent rain infiltration. The final location of the extraction fan will be verified prior to installation in order to maintain appropriate discharge and comply with 10-feet minimum away from any fresh air intake or windows. The active SSDS is an Engineering Control for the remedial action that will be installed under the supervision of the remedial engineer. The remedial engineer will certify in the FER that the active SSDS was designed and properly installed to establish a vacuum in the gas permeable layer and a negative (decreasing outward) pressure gradient across the building slab to prevent vapor migration into the building.

The location and layout of the SSDS is shown in **Figure 10**. A typical section of the system is shown in **Figure 10(B)**.

SOIL VAPOR EXTRACTION (SVE) SYSTEM

The SVE system is proposed to reduce the PCE and BTEX contaminant mass in soil in the vicinity of the vapor hotspot area (SV-1 & SV-2 from RI, and SV-5 from the Phase-II) as identified in the previous RI on the northeastern corner of the Site (proposed rear yard) in order to remediate chlorinated and petroleum-related VOCs. The installation and operation of an active SVE will comprise of an 8-foot length 4-inch diameter slotted (0.050-inch) scheduled-40 PVC screen (extraction pipe) wrapped with a filter fabric sock and installed vertically in an 8-inch coring at a termination depth of 12-feet bgs. The annular around the 4-inch PVC screen will be filled with $\frac{3}{4}$ -inch crushed blue stones to a height not to exceed 4-feet bgs. At 4-feet below grade, the extraction pipe will be connected to a solid 4-inch diameter scheduled-40 PVC and run horizontally west-southwest towards the building rear exterior wall. The extraction PVC piping will run vertically along the building exterior wall and will be equipped with an inline vacuum fan and finished at 6.5-feet above the top of the first-floor roof with a 6-inch goose neck pipe to prevent rain infiltration. The final location of the extraction fan will be verified prior to installation in order to maintain appropriate discharge and comply with 10-feet minimum away from any fresh air intake or windows. The SVE system is an Engineering Control for the remedial action that will be installed under the supervision of the remedial engineer. The remedial engineer will certify in the FER that the SVE system was designed and properly installed to establish a vacuum in the gas permeable layer and a negative pressure.

The location and layout of the SVE is shown in **Figure 10**. A typical section of the system is shown in **Figure 10(A)**.

The SSDS and SVE are permanent engineering controls. These systems will be inspected, and its performance certified at specified intervals as required by the Site Management Plan submitted as part of the FER. Maintenance of the systems will be described in the Site Management Plan in the FER. All as-built drawings, diagrams, calculation and manufacturer documentation for treatment systems will be presented in the FER.

9.0 CRITERIA FOR COMPLETION OF REMEDIATION/TERMINATION OF REMEDIAL SYSTEMS

9.1 Composite Cover System

The composite cover system is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in perpetuity.

9.2 Sub-Slab Depressurization System (SSDS)

The active SSD system will not be discontinued without written approval by NYSDEC and NYSDOH. A proposal to discontinue the active SSD system may be submitted by the property owner based on confirmatory data that justifies such request. Systems will remain in place and operational until permission to discontinue use is granted in writing by NYSDEC and NYSDOH.

9.3 Soil Vapor Extraction System

The SVE system will not be discontinued without written approval by NYSDEC and NYSDOH. A proposal to discontinue the system may be submitted by the property owner after residual contamination concentrations in groundwater: (1) are cleaned up to levels below NYSDEC standards, (2) have become asymptotic over an extended period of time as mandated by the NYSDEC and the NYSDOH, or (3) if NYSDEC has determined that the AS/SVE system has reached the limit of its effectiveness. This assessment will be based in part on post-remediation contaminant levels in groundwater collected from monitoring wells located throughout the Site. Systems will remain in place and operational until permission to discontinue their use is granted in writing by NYSDEC and NYSDOH. These sampling/monitoring activities will adhere to stipulations outlined in the Monitoring Plan section of the SMP.

10.0 INSTITUTIONAL CONTROLS

After the remedy is complete, the Site will have residual contamination remaining in place. Engineering Controls (ECs) for the residual contamination have been incorporated into the remedy to render the overall Site remedy protective of public health and the environment. Two elements have been designed to ensure continual and proper management of residual contamination in perpetuity: an Environmental Easement and a Site Management Plan.

All as-built drawings, diagrams, calculation and manufacturer documentation for treatment systems will be presented in the FER. A Site -specific Environmental Easement will be recorded with the City of New York to provide an enforceable means of ensuring the continual and proper management of residual contamination and protection of public health and the environment in perpetuity or until released in writing by NYSDEC. It requires that the grantor of the Environmental Easement and the grantor's successors and assigns adhere to all Engineering and Institutional Controls (ECs/ICs) placed on this Site by this NYSDEC-approved remedy. ICs provide restrictions on Site usage and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. The Site Management Plan (SMP) describes appropriate methods and procedures to ensure compliance with all ECs and ICs that are required by the Environmental Easement. Once the SMP has been approved by the NYSDEC, compliance with the SMP is required by the grantor of the Environmental Easement and grantor's successors and assigns.

10.1 ENVIRONMENTAL EASEMENT

An Environmental Easement, as defined in Article 71 Title 36 of the Environmental Conservation Law, is required when residual contamination is left on-Site after the Remedial Action is complete. As part of this remedy, an Environmental Easement approved by NYSDEC will be filed and recorded with the City of New York, Office of the City Register. The Environmental Easement will be submitted as part of the Final Engineering Report.

The Environmental Easement renders the Site a Controlled Property. The Environmental Easement must be recorded with the Brooklyn County Office of the City Register before the Certificate of Completion can be issued by NYSDEC. A series of Institutional Controls are required

under this remedy to implement, maintain and monitor these Engineering Control systems, prevent future exposure to residual contamination by controlling disturbances of the subsurface soil and restricting the use of the Site to mixed commercial and residential uses only. These Institutional Controls are requirements or restrictions placed on the Site that are listed in, and required by, the Environmental Easement. Institutional Controls can, generally, be subdivided between controls that support Engineering Controls, and those that place general restrictions on Site usage or other requirements. Institutional Controls in both of these groups are closely integrated with the Site Management Plan, which provides all of the methods and procedures to be followed to comply with this remedy.

The Institutional Controls that support Engineering Controls are:

- Compliance with the Environmental Easement by the Grantee and the Grantee's successors and adherence of all elements of the SMP is required;
- All Engineering Controls must be operated and maintained as specified in this SMP;
- A composite cover system consisting of 4-inches of reinforced concrete cellar slab underlain by a 20-mil vapor barrier (an element of construction (not an EC)) and 6-inches of $\frac{3}{4}$ -inch imported crushed stone to be placed beneath the entire proposed building footprint, and 4-inches of reinforced concrete slab underlain by 8-inches of $\frac{3}{4}$ -inch imported crushed stone and 1 to 1.5-ft. of certified clean fill for the proposed rear yard and side yard, must be inspected, certified and maintained as required in the SMP (**Figure 8**);
- A sub-slab depressurization system (SSDS) under all building structures must be inspected, certified, operated and maintained as required by the SMP;
- A soil vapor extraction system under all building structures must be inspected, certified, operated and maintained as required by the SMP;
- All Engineering Controls on the Controlled Property must be inspected and certified at a frequency and in a manner defined in the SMP;

- Any other environmental or public health monitoring must be performed as defined in the SMP;
- Data and information pertinent to Site Management for the Controlled Property must be reported at the frequency and in a manner defined in the SMP;
- On-Site environmental monitoring devices, including but not limited to, [groundwater monitor wells and soil vapor probes], must be protected and replaced as necessary to ensure proper functioning in the manner specified in the SMP;
- Engineering Controls may not be discontinued without an amendment or extinguishment of the Environmental Easement.

Adherence to these Institutional Controls for the Site is mandated by the Environmental Easement and will be implemented under the Site Management Plan (discussed in the next section). The Controlled Property (Site) will also have a series of Institutional Controls in the form of Site restrictions and requirements. The Site restrictions that apply to the Controlled Property are:

- Vegetable gardens and farming on the Controlled Property are prohibited;
- Use of groundwater underlying the Controlled Property is prohibited without treatment rendering it safe for intended purpose;
- All future activities on the Controlled Property that will disturb residual contaminated material are prohibited unless they are conducted in accordance with the soil management provisions in the Site Management Plan;
- The Controlled Property may be used for [usage type: e.g. restricted commercial] use only, provided the long-term Engineering and Institutional Controls included in the Site Management Plan are employed;
- The Controlled Property may not be used for a higher level of use, such as restricted residential use without an amendment or extinguishment of this Environmental Easement;

- Grantor agrees to submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow. This annual statement must be certified by an expert that the NYSDEC finds acceptable.

10.2 SITE MANAGEMENT PLAN

Site Management is the last phase of remediation and begins with the approval of the Final Engineering Report and issuance of the Certificate of Completion (COC) for the Remedial Action. The Site Management Plan is submitted as part of the FER but will be written in a manner that allows its removal and use as a complete and independent document. Site Management continues in perpetuity or until released in writing by NYSDEC. The property owner is responsible to ensure that all Site Management responsibilities defined in the Environmental Easement and the Site Management Plan are performed.

Site Management Plans should include methods to incorporate and Track GSR. Measures should be taken to maintain a cost-effective, protective remedy that remains conscientious of the Site's environmental footprint. At a minimum, the following should be assessed: waste generation, energy usage, emissions, and water usage.

The SMP is intended to provide a detailed description of the procedures required to manage residual contamination left in place at the Site following completion of the Remedial Action in accordance with the BCA with the NYSDEC. This includes: (1) development, implementation, and management of all Engineering and Institutional Controls; (2) development and implementation of monitoring systems and a Monitoring Plan; (3) development of a plan to operate and maintain any treatment, collection, containment, or recovery systems (including, where appropriate,

preparation of an Operation and Maintenance Manual); (4) submittal of Site Management Reports, performance of inspections and certification of results, and demonstration of proper communication of Site information to NYSDEC; and (5) defining criteria for termination of treatment system operation.

To address these needs, this SMP will include four plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; (2) a Monitoring Plan for implementation of Site Monitoring; (3) an Operation and Maintenance Plan for implementation of remedial collection, containment, treatment, and recovery systems; and (4) a Site Management Reporting Plan for submittal of data, information, recommendations, and certifications to NYSDEC. The SMP will be prepared in accordance with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation and the guidelines provided by NYSDEC.

Site management activities, reporting, and EC/IC certification will be scheduled on a certification period basis. The certification period will be on an annual basis. The Site Management Plan will be based on a calendar year and will be due for submission to NYSDEC by March 1 of the year following the reporting period.

The Site Management Plan in the Final Engineering Report will include a monitoring plan for groundwater at the down-gradient Site perimeter to evaluate Site -wide performance of the remedy. Groundwater monitor wells will also be installed immediately down-gradient of all VOC remediation areas for the purpose of evaluation of the effectiveness of the remedy that is implemented.

No exclusions for handling of residual contaminated soils will be provided in the Site Management Plan (SMP). All handling of residual contaminated material will be subject to provisions contained in the SMP.

11.0 FINAL ENGINEERING REPORT

A Final Engineering Report (FER) will be submitted to NYSDEC following implementation of the Remedial Action defined in this RAWP. The FER provides the documentation that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The FER will provide a comprehensive account of the locations and characteristics of all material removed from the Site including the surveyed map(s) of all sources. The Final Engineering Report will include as-built drawings for all constructed elements, calculation and manufacturer documentation for treatment systems, certifications, manifests, bills of lading as well as the complete Site Management Plan (formerly the Operation and Maintenance Plan). The FER will provide a description of the changes in the Remedial Action from the elements provided in the RAWP and associated design documents. The FER will provide a tabular summary of all performance evaluation sampling results and all material characterization results and other sampling and chemical analysis performed as part of the Remedial Action. The FER will provide test results demonstrating that all mitigation and remedial systems are functioning properly. The FER will be prepared in conformance with DER-10.

Where determined to be necessary by NYSDEC, a Financial Assurance Plan will be required to ensure the sufficiency of revenue to perform long-term operations, maintenance and monitoring tasks defined in the Site Management Plan and Environmental Easement. This determination will be made by NYSDEC in the context of the Final Engineering Report review.

The Final Engineering Report will include written and photographic documentation of all remedial work performed under this remedy. The FER will include an itemized tabular description of actual costs incurred during all aspects of the Remedial Action.

The FER will provide a thorough summary of all residual contamination left on the Site after the remedy is complete. Residual contamination includes all contamination that exceeds the Unrestricted Use SCO in 6NYCRR Part 375-6. A table that shows exceedances from Unrestricted SCOs for all soil/fill remaining at the Site after the Remedial Action and a map that shows the location and summarizes exceedances from Unrestricted SCOs for all soil/fill remaining at the Site after the Remedial Action will be included in the FER.

The FER will provide a thorough summary of all residual contamination that exceeds the SCOs defined for the Site in the RAWP and must provide an explanation for why the material was not removed as part of the Remedial Action. A table that shows residual contamination in excess of Site SCOs and a map that shows residual contamination in excess of Site SCOs will be included in the FER.

The Final Engineering Report will include an accounting of the destination of all material removed from the Site, including excavated contaminated soil, historic fill, solid waste, hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. It will provide an accounting of the origin and chemical quality of all material imported onto the Site.

Final Engineering Reports must include a discussion of the green remediation practices/technologies employed throughout the remedial program. A final footprint analysis using a DER accepted model, and any Tracking methods used through the construction including restoration activities. Before approval of a FER and issuance of a Certificate of Completion, all project reports must be submitted in digital form on electronic media (PDF).

11.1 CERTIFICATIONS

The following certification will appear in front of the Executive Summary of the Final Engineering Report. The certification will be signed by the Remedial Engineer Karen Tyll, PE who is a Professional Engineer registered in New York State. This certification will be appropriately signed and stamped. The certification will include the following statements:

I, Karen Tyll, PE, am currently a registered professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the 1665-1673 Stillwell Avenue Site (NYSDEC Site No. C224307).

I certify that the Site description presented in this FER is identical to the Site descriptions presented in the Environmental Easement, the Site Management Plan, and the Brownfield Cleanup Agreement for 1665-1673 Stillwell Avenue and related amendments.

I certify that the Remedial Action Work Plan dated [month day year] and Stipulations [if any] in a letter dated [month day year] and approved by the NYSDEC were implemented and that all requirements in those documents have been substantively complied with.

I certify that the remedial activities were observed by qualified environmental professionals under my supervision and that the remediation requirements set forth in the Remedial Action Work Plan and any other relevant provisions of ECL 27-1419 have been achieved.

I certify that all use restrictions, Institutional Controls, Engineering Controls, and all operation and maintenance requirements applicable to the Site are contained in an Environmental Easement created and recorded pursuant ECL 71-3605 and that all affected local governments, as defined in ECL 71-3603, have been notified that such easement has been recorded. A Site Management Plan has been submitted by the Volunteer for the continual and proper operation, maintenance, and monitoring of all Engineering Controls employed at the Site, including the proper maintenance of all remaining monitoring wells, and that such plan has been approved by the NYSDEC.

I certify that the export of all contaminated soil, fill, water or other material from the property was performed in accordance with the Remedial Action Work Plan, and were taken to facilities licensed to accept this material in full compliance with all Federal, State and local laws.

I certify that all import of soils from off-Site, including source approval and sampling, has been performed in a manner that is consistent with the methodology defined in the Remedial Action Work Plan.

I certify that all invasive work during the remediation and all invasive development work were conducted in accordance with dust and odor suppression methodology and soil screening methodology defined in the Remedial Action Work Plan.

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

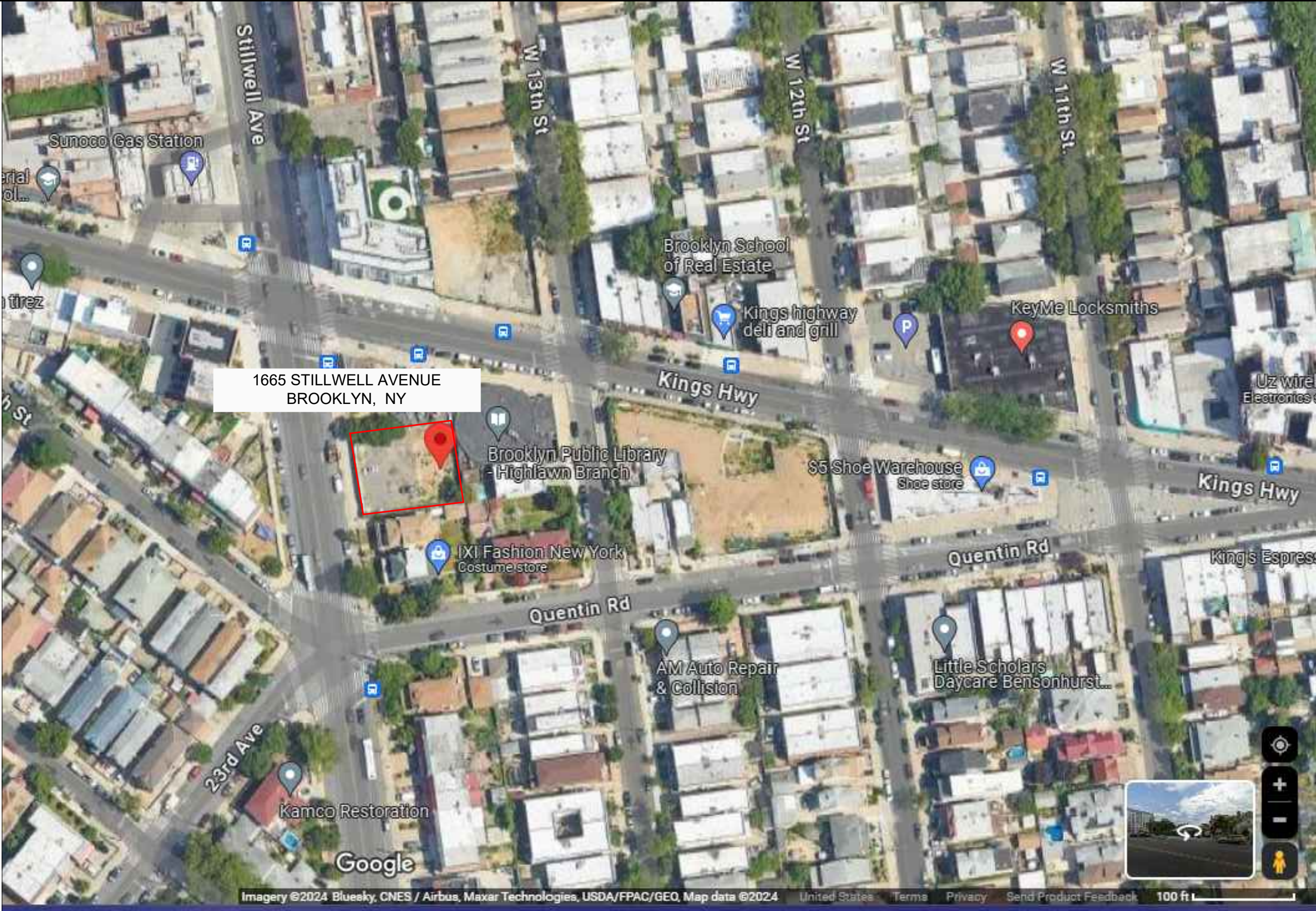
It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

12.0 SCHEDULE

The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, it will be updated and submitted to NYSDEC. Currently, a three-month remediation period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
NYSDEC Approval of RAWP	0	-
Fact Sheet 2 announcing start of remedy	0	4
Mobilization	4	2
Remedial Excavation	6	16
Demobilization	22	2
Submit Final Engineering Report	30	6

Figures



PREPARED BY:



**TYLL ENGINEERING &
CONSULTING PC**

169 Commack Road, Suite H173, Commack, NY 11725
PHONE: (631) 629-5373 info@tyllengineering.com

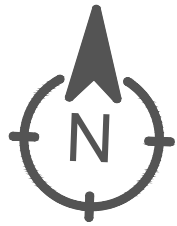
TITLE:

SITE LOCATION MAP

1665 STILLWELL AVENUE
BROOKLYN, NY

DRAWN: -	SCALE: NTS	DATE: 02/14/2024	PROJECT NO.: RSK2305
CHECKED: KT	APPROVED: KT	REVISION: -	NOTES: -

FIGURE NO.:
1



PREPARED BY:



TYLL ENGINEERING & CONSULTING PC

169 Commack Road, Suite H173, Commack, NY 11725
PHONE: (631) 629-5373 info@tyllengineering.com

SURROUNDING LAND USE MAP

1665 STILLWELL AVENUE
BROOKLYN, NY

DRAWN:

-

CHECKED:

KT

FIGURE NO.:

SCALE:

NTS

APPROVED:

KT

DATE:

02/14/2024

REVISION:

-

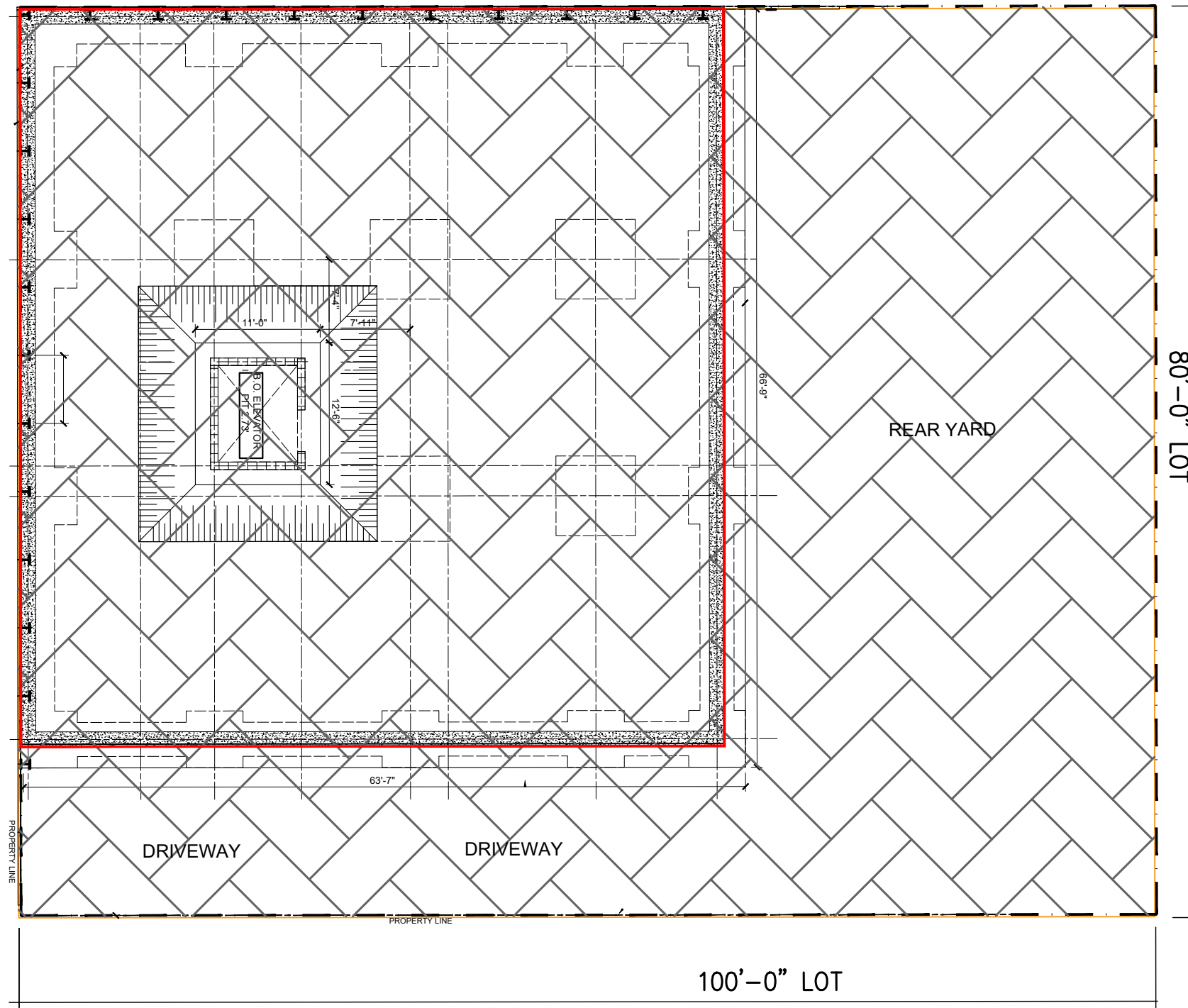
PROJECT NO.:

RSK2305

NOTES:




-

STILLWELL AVENUE



LEGEND

PROPOSED REMEDIAL EXCAVATION

-  -17' SITE-WIDE EXCAVATION (TRACK 1)
-  PROPOSED CELLAR/BUILDING LINE
-  LOT LINE

PREPARED BY:



TYLL ENGINEERING & CONSULTING PC

169 Commack Road, Suite H173, Commack, NY 11725
PHONE: (631) 629-5373 info@tyllengineering.com

TITLE:

PROPOSED SITE EXCAVATION PLAN (Track 1)

1665 STILLWELL AVENUE
BROOKLYN, NY

DRAWN:

-

SCALE:

NTS

DATE:

09/20/2024

PROJECT NO.:

CHECKED:

KT

APPROVED:

KT

REVISION:

-

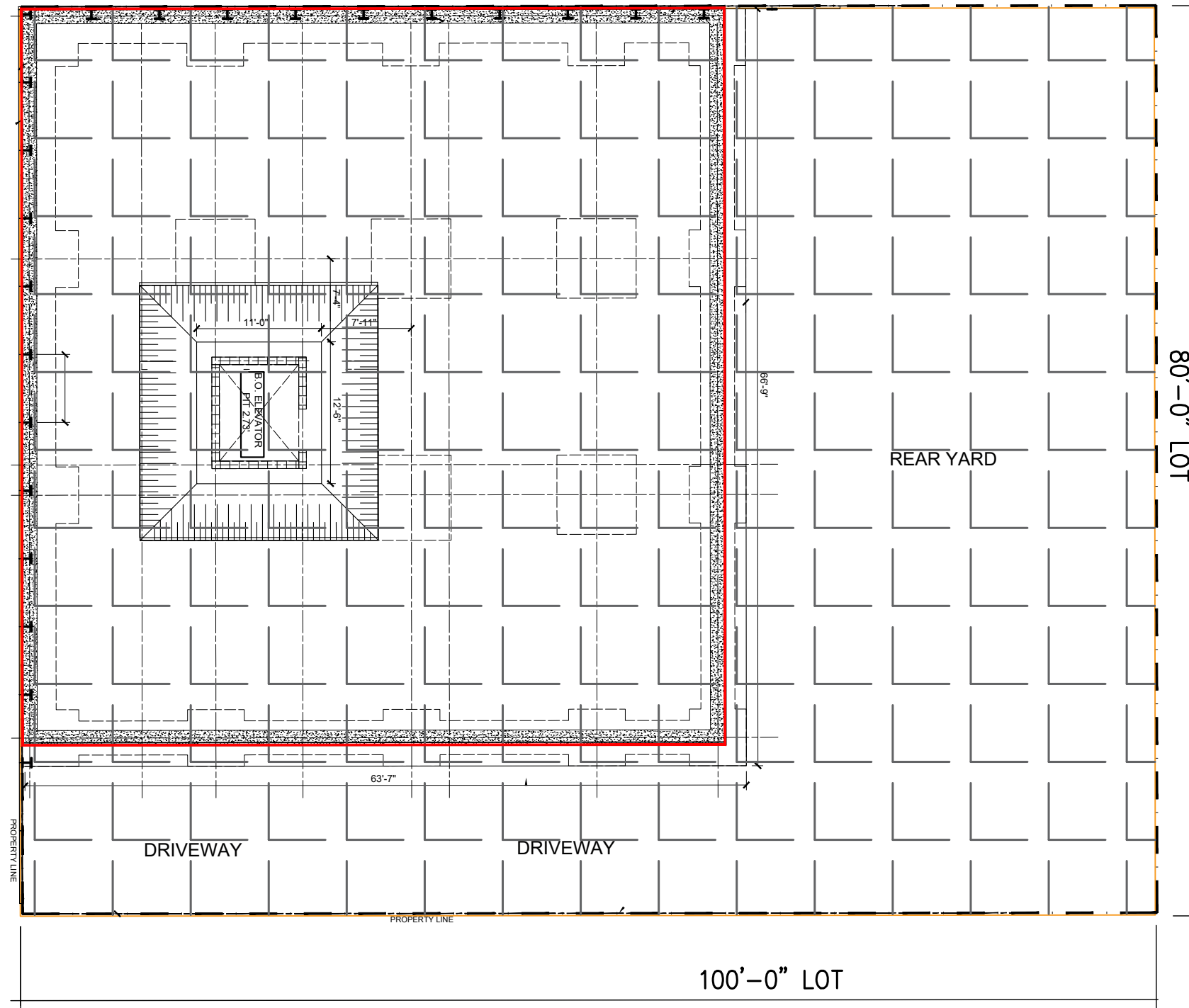
NOTES:

-

FIGURE NO.:

4.1


STILLWELL AVENUE




LEGEND

PROPOSED REMEDIAL EXCAVATION

 -4' SITE-WIDE EXCAVATION (TRACK 2)

 PROPOSED CELLAR/BUILDING LINE

 LOT LINE

PREPARED BY:



TYLL ENGINEERING & CONSULTING PC

169 Commack Road, Suite H173, Commack, NY 11725
PHONE: (631) 629-5373 info@tyllengineering.com

TITLE:

PROPOSED SITE EXCAVATION PLAN (Track 2)

1665 STILLWELL AVENUE
BROOKLYN, NY

DRAWN:

-

SCALE:

NTS

DATE:

09/20/2024

PROJECT NO.:

CHECKED:

KT

APPROVED:

KT

REVISION:

-

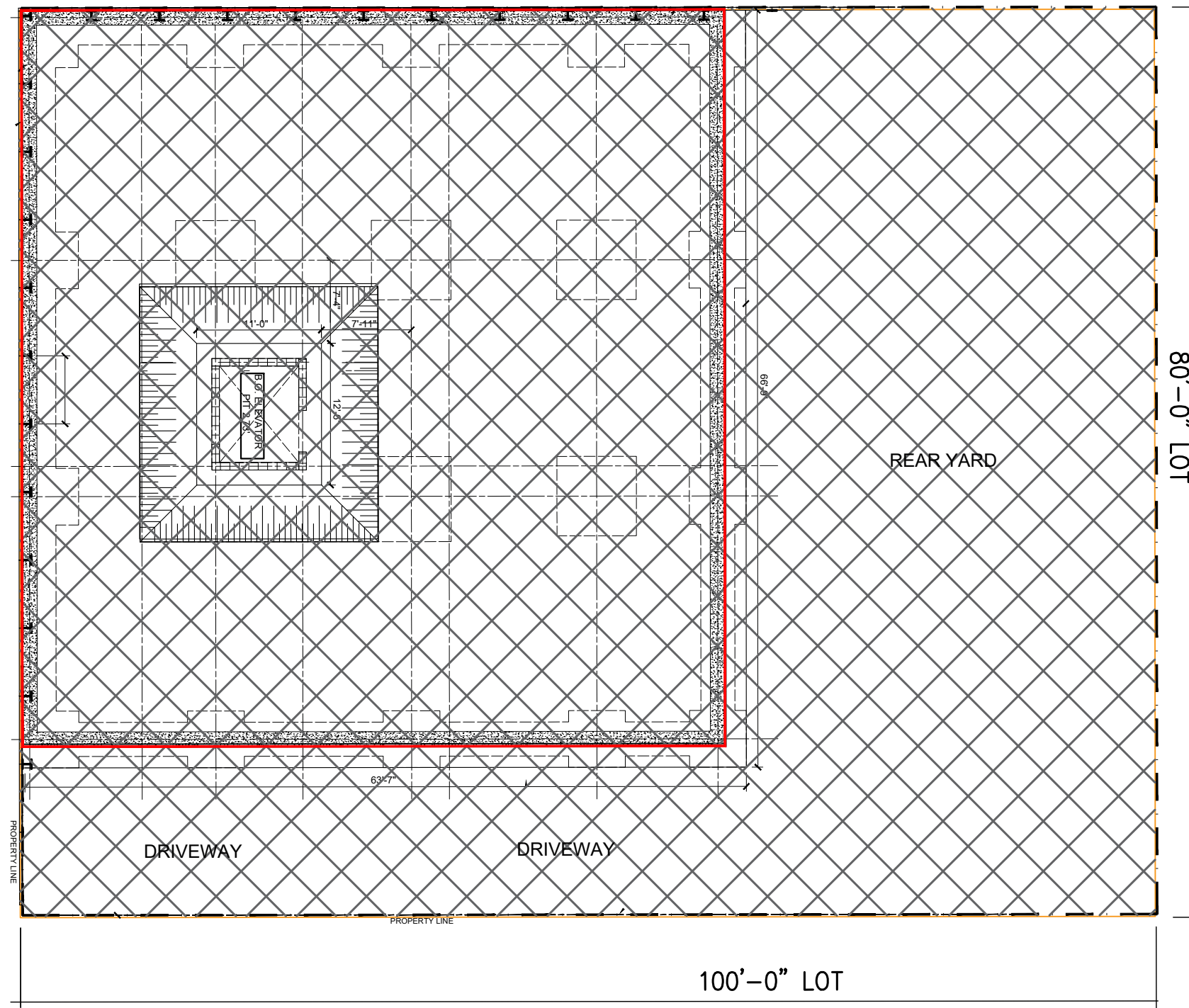
NOTES:

-

FIGURE NO.:




4.2

STILLWELL AVENUE



LEGEND

PROPOSED REMEDIAL EXCAVATION

-  -2' SITE-WIDE EXCAVATION (TRACK 4)
-  PROPOSED CELLAR/BUILDING LINE
-  LOT LINE

PREPARED BY:



TYLL ENGINEERING & CONSULTING PC

169 Commack Road, Suite H173, Commack, NY 11725
PHONE: (631) 629-5373 info@tyllengineering.com

TITLE:

PROPOSED SITE EXCAVATION PLAN (Track 4)

1665 STILLWELL AVENUE
BROOKLYN, NY

DRAWN:

-

SCALE:

NTS

DATE:

09/20/2024

PROJECT NO.:

CHECKED:

KT

APPROVED:

KT

REVISION:

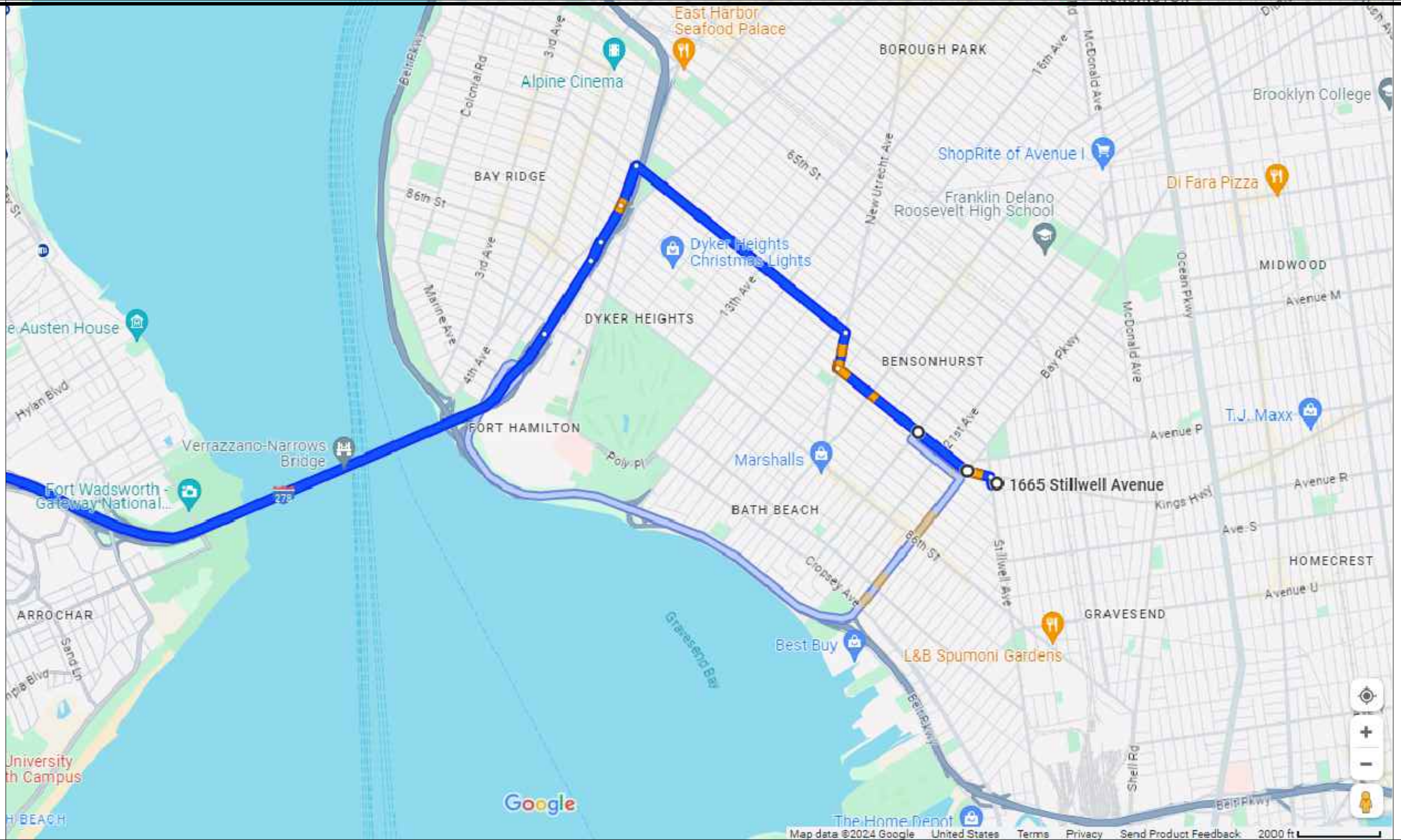
-

NOTES:

-

FIGURE NO.:

4.3



PREPARED BY:



TYLL ENGINEERING & CONSULTING PC

169 Commack Road, Suite H173, Commack, NY 11725
PHONE: (631) 629-5373 info@tyllengineering.com

TITLE:

TRUCK ROUTE MAP

1665 STILLWELL AVENUE
BROOKLYN, NY

DRAWN:

-

CHECKED:

KT

FIGURE NO.:

SCALE:

NTS

APPROVED:

KT

DATE:

02/14/2024

REVISION:

-

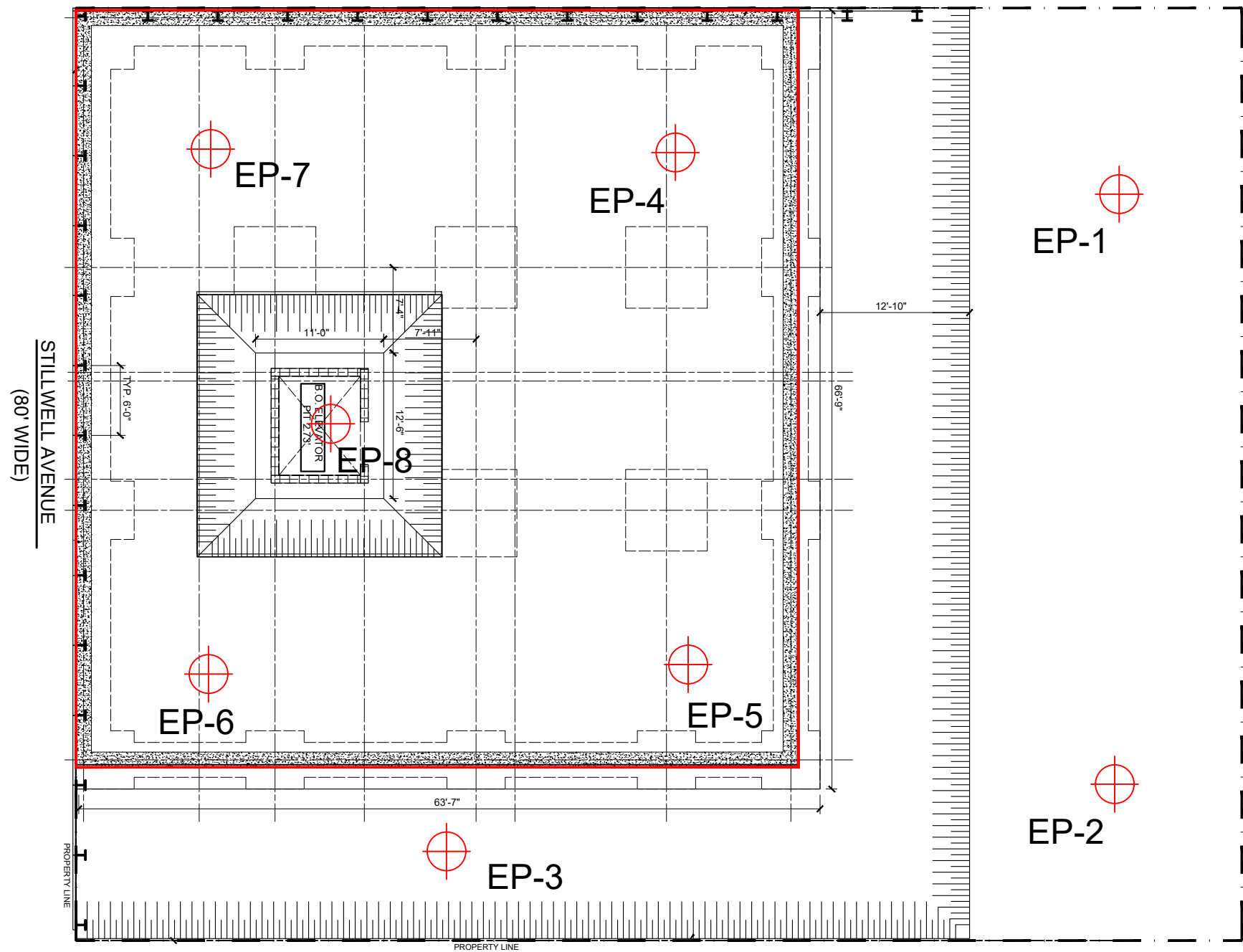
PROJECT NO.:

RSK2305




NOTES:

-

5



LEGEND

-  PROPOSED ENDPOINT SAMPLE LOCATION
-  PROPOSED CELLAR LINE
-  LOT LINE

PREPARED BY:



**TYLL ENGINEERING &
CONSULTING PC**

169 Commack Road, Suite H173, Commack, NY 11725
PHONE: (631) 629-5373 info@tyllengineering.com

TITLE:

**PROPOSED ENDPOINT SAMPLE
LOCATION MAP**

1665 STILLWELL AVENUE
BROOKLYN, NY

DRAWN:

-

SCALE:

NTS

DATE:

02/14/2024

PROJECT NO.:

RSK2305

CHECKED:

KT

APPROVED:

KT

REVISION:

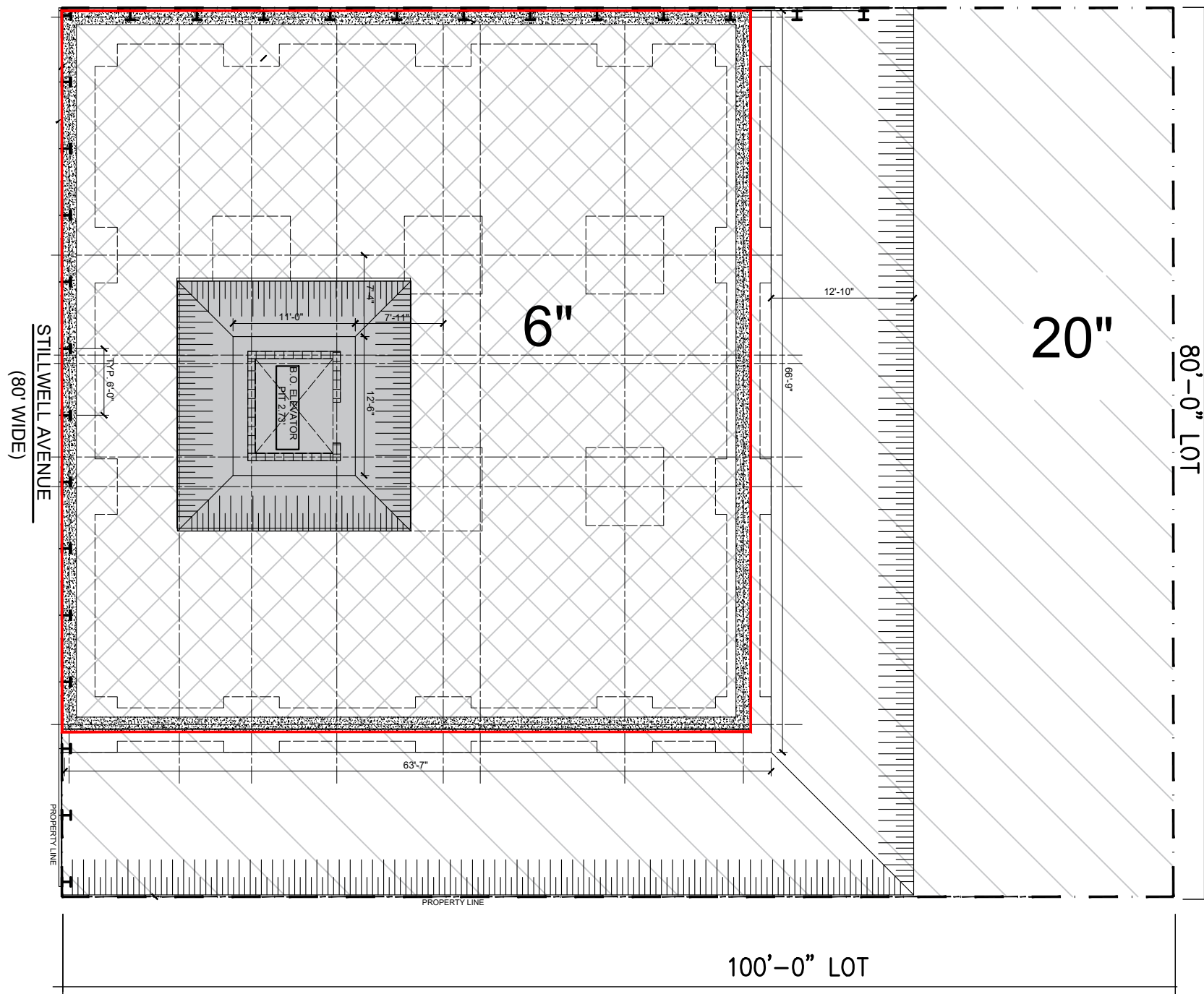
-

NOTES:

-

FIGURE NO.:

6



LEGEND	
	PROPOSED 8" LAYER OF 3/4" CRUSHED BLUESTONES UNDERLAIN WITH 12" C.C. FILL IN REAR YARD & DRIVEWAY
	PROPOSED 6" LAYER OF 3/4" CRUSHED BLUESTONES IN CELLAR AREA
	PROPOSED CELLAR LINE
	LOT LINE

PREPARED BY:



**TYLL ENGINEERING &
CONSULTING PC**

169 Commack Road, Suite H173, Commack, NY 11725
PHONE: (631) 629-5373 info@tyllengineering.com

TITLE:

PROPOSED BACKFILL PLACEMENT MAP

1665 STILLWELL AVENUE
BROOKLYN, NY

DRAWN:

-

SCALE:

NTS

DATE:

02/14/2024

PROJECT NO.:

RSK2305

CHECKED:

KT

APPROVED:

KT

REVISION:

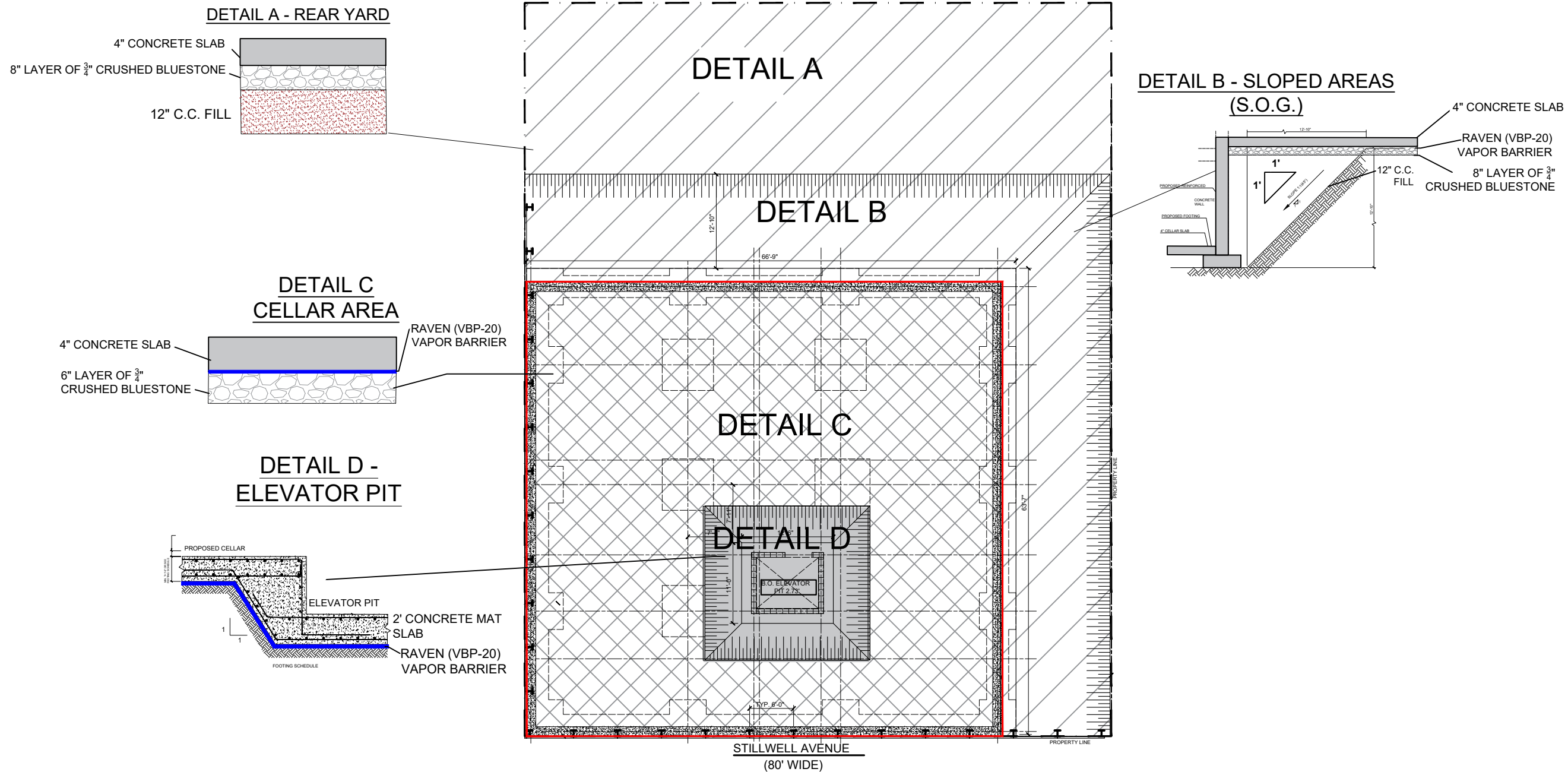
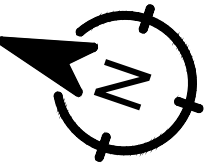
-

NOTES:

-

FIGURE NO.:

7



LEGEND			
	PROPOSED 8" LAYER OF 3/4" CRUSHED BLUESTONE UNDERLAIN WITH 12" C.C. REAR YARD & DRIVEWAY - DETAILS A & B		
	PROPOSED 6" LAYER OF 3/4" CRUSHED BLUESTONE CELLAR AREA - DETAIL C		
	ELEVATOR PIT DETAIL D		
	PROPOSED CELLAR LINE		
	LOT LINE		

PREPARED BY:



TYLL ENGINEERING & CONSULTING PC

169 Commack Road, Suite H173, Commack, NY 11725
PHONE: (631) 629-5373 info@tyllengineering.com

TITLE:

COMPOSITE COVER SYSTEM PLAN AND DETAILS

1665 STILLWELL AVENUE
BROOKLYN, NY

DRAWN:

-

SCALE:

NTS

DATE:

02/14/2024

PROJECT NO.:

RK2305

CHECKED:

KT

APPROVED:

KT

REVISION:

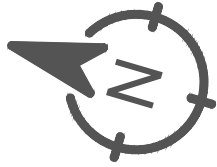
-

NOTES:

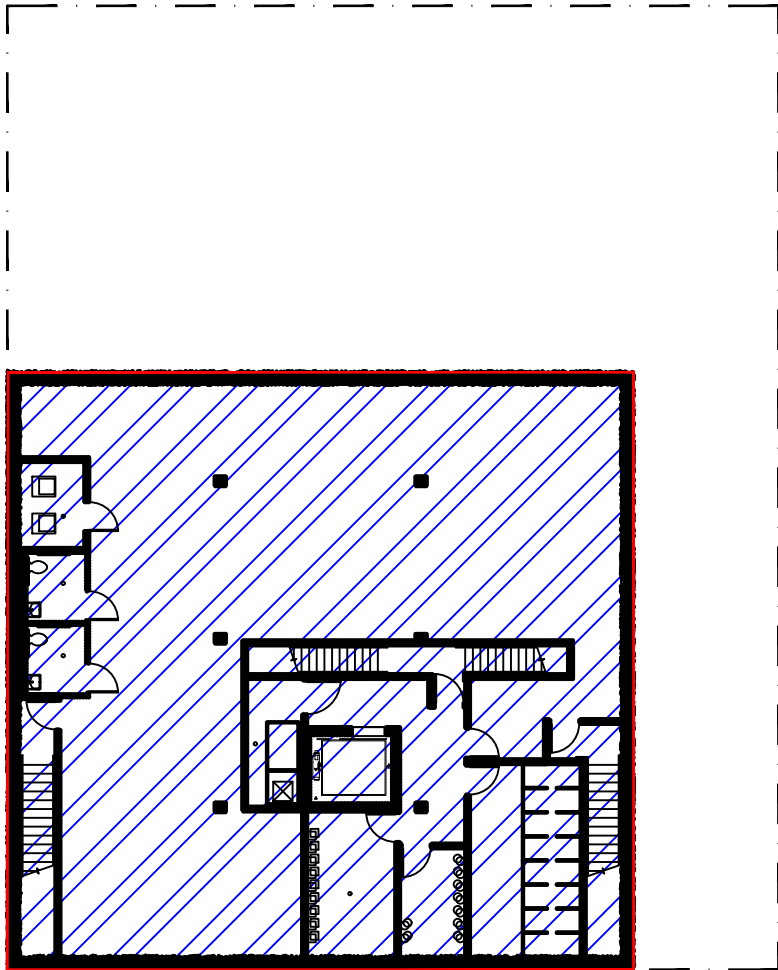
-

FIGURE NO.:

8

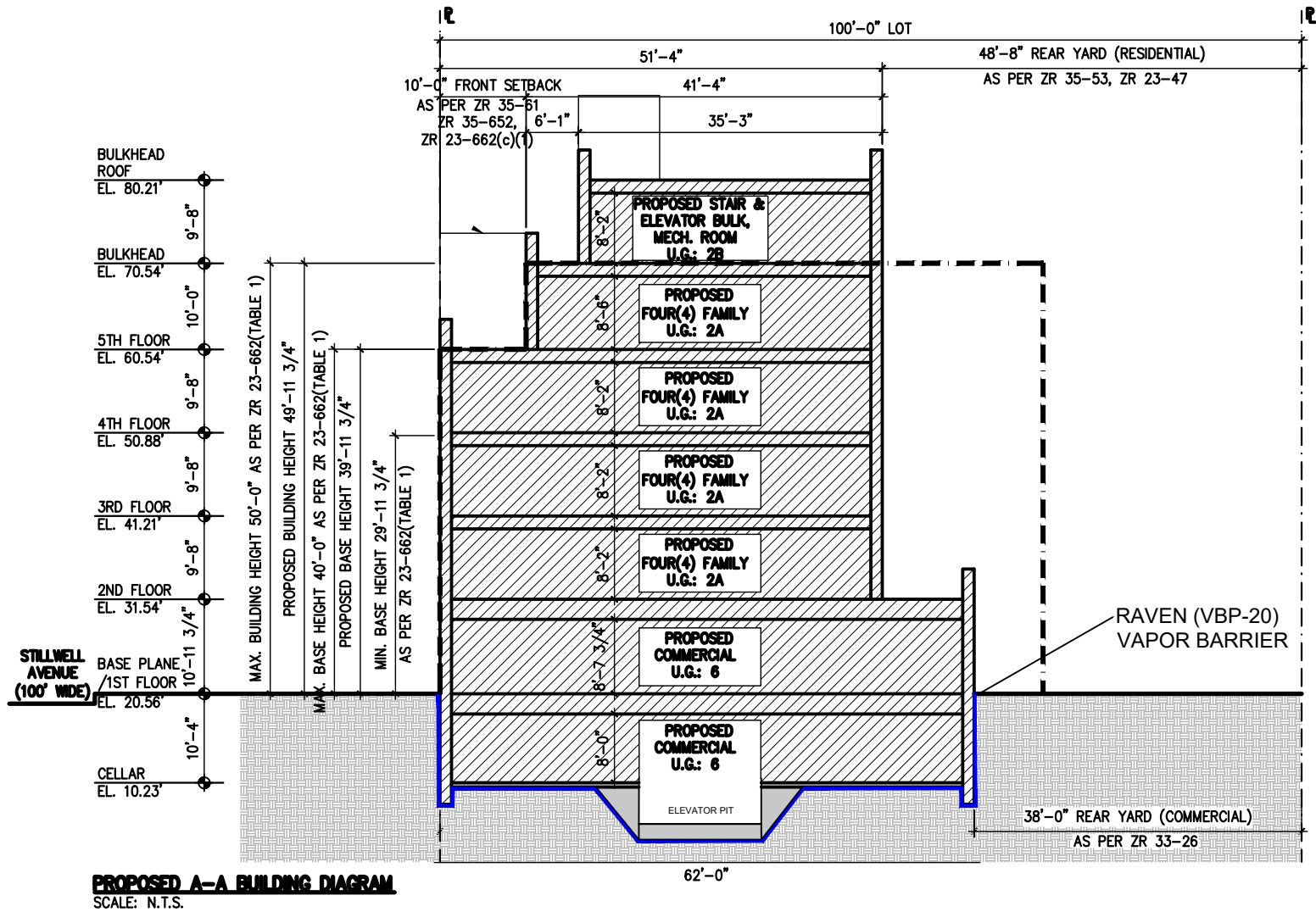


DETAIL A: VAPOR BARRIER
SITE-WIDE LAYOUT



STILLWELL AVE

DETAIL B: VAPOR BARRIER LAYOUT (SIDE VIEW)



LEGEND	
	PROPOSED RAVEN (VBP 20) VAPOR BARRIER
	PROPOSED CELLAR LINE
	LOT LINE

PREPARED BY:



**TYLL ENGINEERING &
CONSULTING PC**

169 Commack Road, Suite H173, Commack, NY 11725
PHONE: (631) 629-5373 info@tyllengineering.com

TITLE:

VAPOR BARRIER SYSTEM LAYOUT

1665 STILLWELL AVENUE
BROOKLYN, NY

DRAWN:

-

CHECKED:

KT

FIGURE NO.:

SCALE:

NTS

APPROVED:

KT

DATE:

02/14/2024

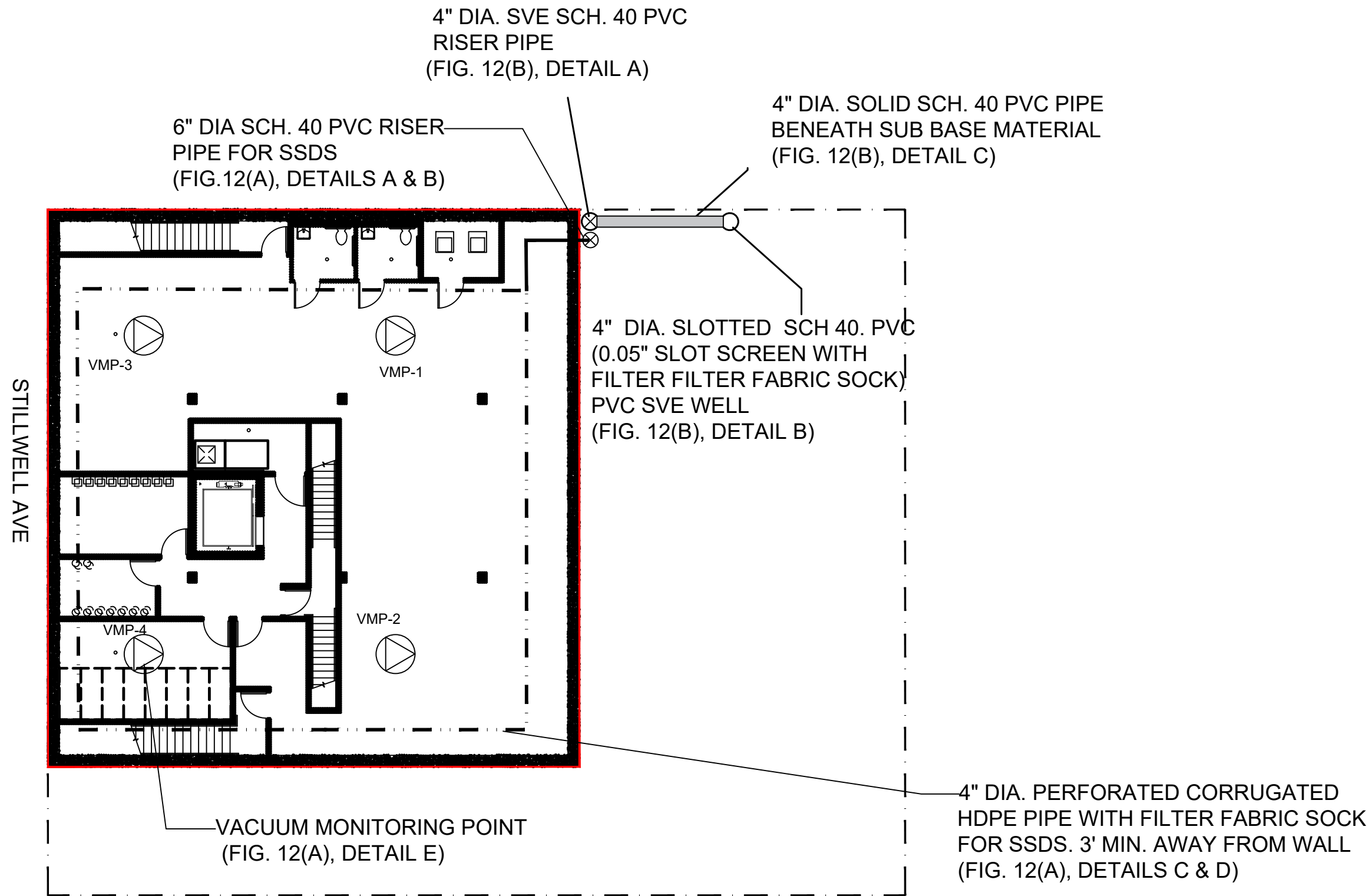
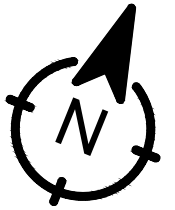
REVISION:

-

PROJECT NO.:

NOTES:

-



LEGEND

	PROPOSED CELLAR LINE
	LOT LINE
	4" DIA. SOLID PVC PIPE FOR SVE
	4" DIA. CORRUGATED PIPE FOR SSDS
	RISER LOCATION
	VACUUM MONITORING POINT

PREPARED BY:



TYLL ENGINEERING & CONSULTING PC

169 Commack Road, Suite H173, Commack, NY 11725
PHONE: (631) 629-5373 info@tyllengineering.com

TITLE:

PROPOSED ACTIVE SSDS & SVE LAYOUT

1665 STILLWELL AVENUE
BROOKLYN, NY

DRAWN:

-

SCALE:

NTS

DATE:

02/14/2024

PROJECT NO.:

CHECKED:

KT

APPROVED:

KT

REVISION:

-

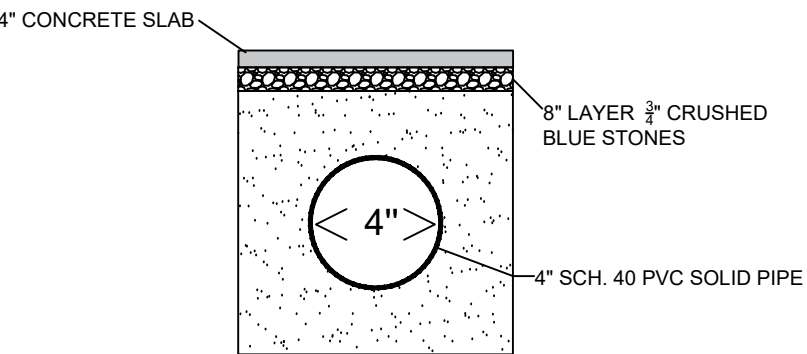
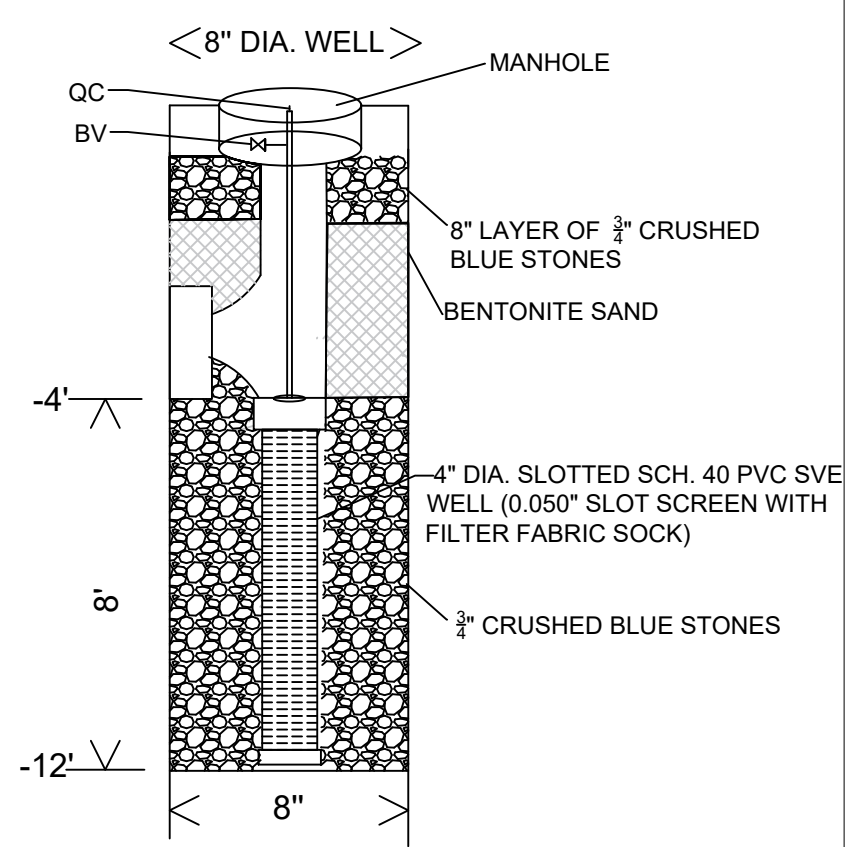
NOTES:

-

FIGURE NO.:

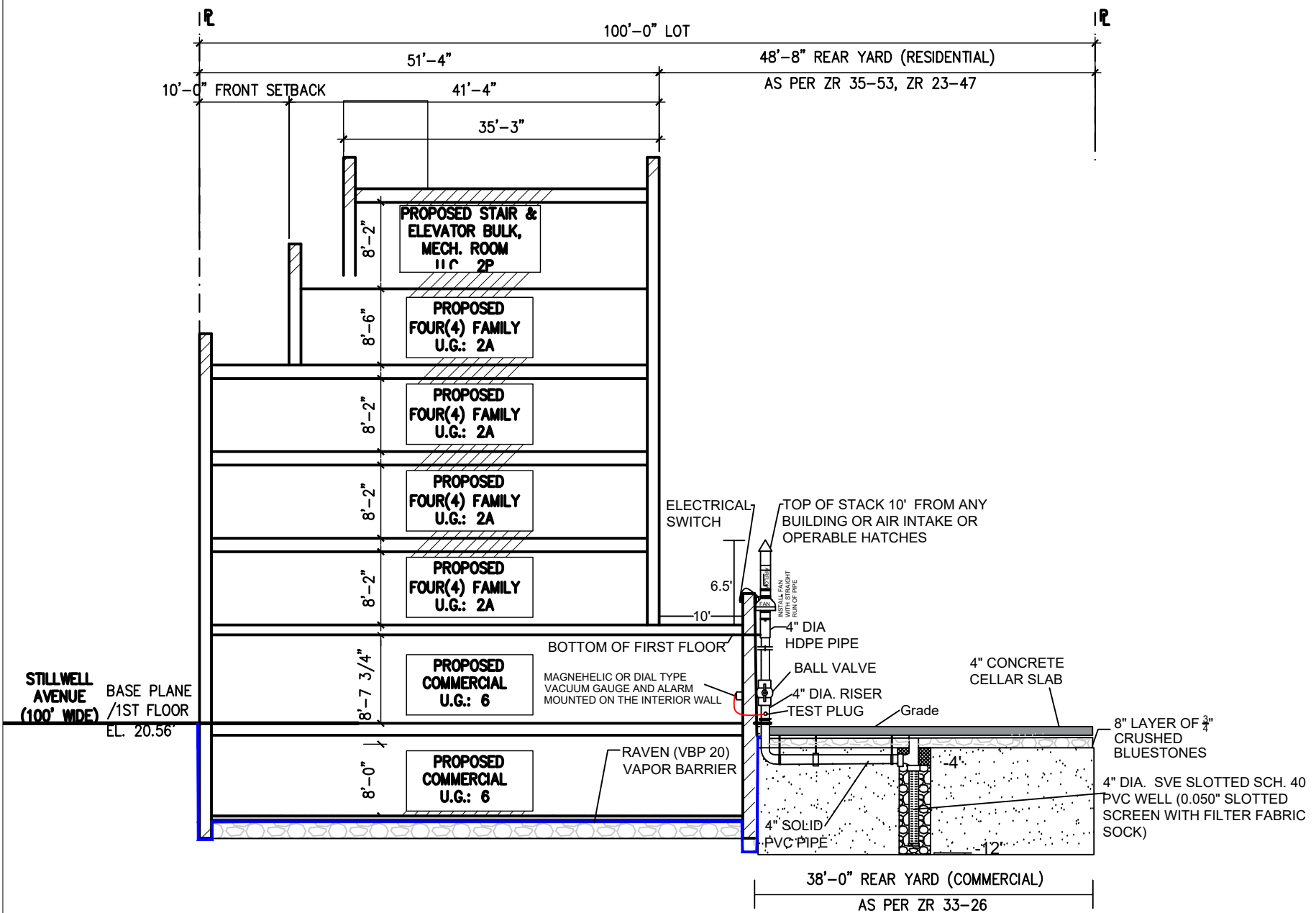
10

DETAIL B: SVE WELL (N.T.S.)



DETAIL C:
SVE SOLID PIPE
CROSS-SECTION VIEW

DETAIL A: SVE SYSTEM LAYOUT (SIDE VIEW)



LEGEND

- PROPOSED RAVEN (VBP 20) VAPOR BARRIER
- 3/4\"/>
- IMPORTED CLEAN SOIL
- 4\"/>
- BALL VALVE
- QUICK CONNECT

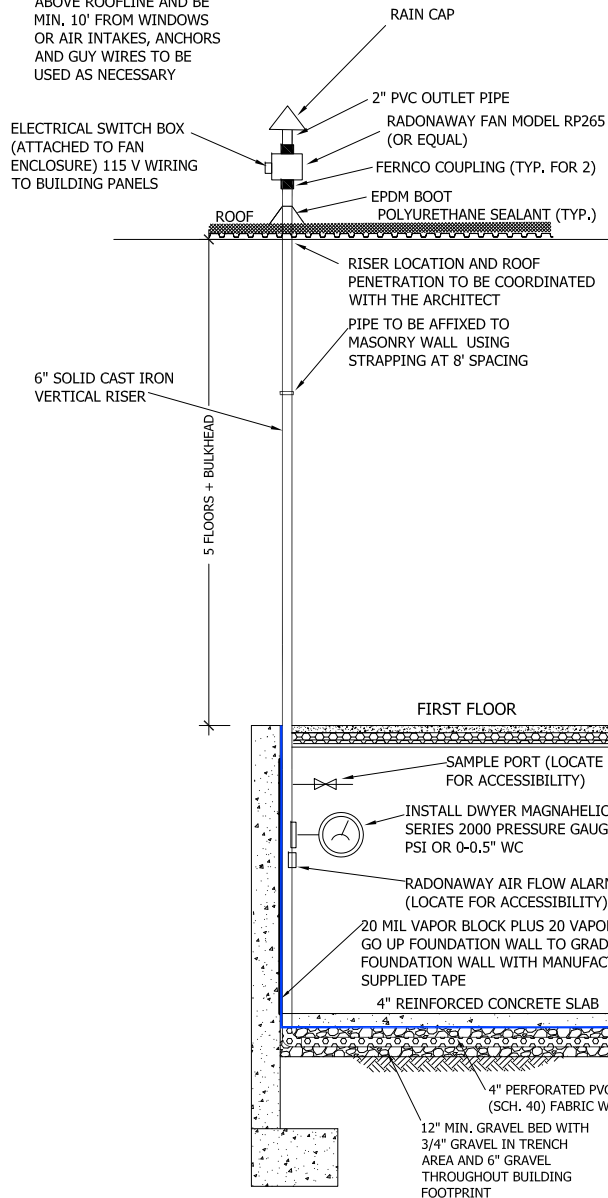
PREPARED BY:

TYLL ENGINEERING & CONSULTING PC
169 Commack Road, Suite H173, Commack, NY 11725
PHONE: (631) 629-5373 info@tyllengineering.com

PROPOSED SVE DETAILS
1665 STILLWELL AVENUE
BROOKLYN, NY

DRAWN:	SCALE:	DATE:	PROJECT NO.:
-	NTS	02/14/2024	
CHECKED:	APPROVED:	REVISION:	NOTES:
KT	KT	-	-
FIGURE NO.:		10 (A)	

EXHAUST STACK TO
TERMINATE A MIN. OF 7'
ABOVE ROOFLINE AND BE
MIN. 10' FROM WINDOWS
OR AIR INTAKES, ANCHORS
AND GUY WIRES TO BE
USED AS NECESSARY

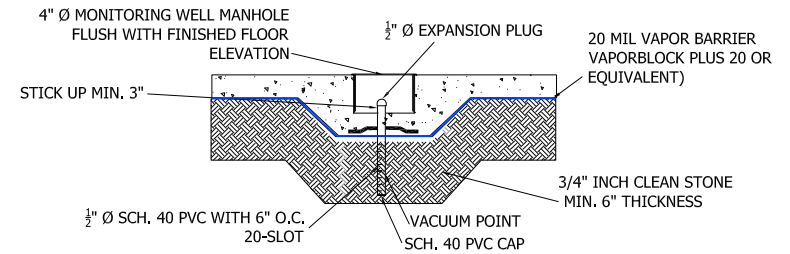


TYPICAL SSDS PROFILE

SCALE: NTS

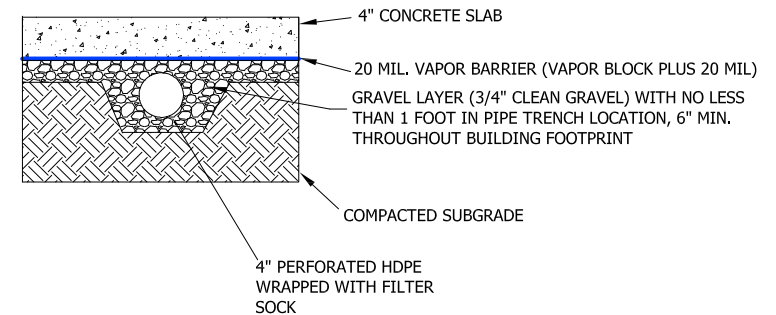
NOTES:

1. SEAL ALL PERFORATIONS, JOINTS AND SEAMS IN VAPOR BARRIER FOLLOWING MANUFACTURER'S RECOMMENDATIONS WITH SUPPLIED TAPE.
2. NYSDEC MUST PRE-APPROVE ALL FILL MATERIAL BEFORE DELIVERY TO SITE.
3. RSK ENVIRONMENTAL/ TEC MUST INSPECT, PHOTOGRAPH, AND DOCUMENT SSDS INSTALLATION (INCLUDING PIPING AND VAPOR BARRIER) BEFORE BACKFILLING AND/OR POURING OF CONCRETE SLAB.



TYPICAL VACUUM MONITORING POINT

SCALE: NTS



TYPICAL PIPE TRENCH DETAIL

SCALE: NTS

PREPARED BY:



TYLL ENGINEERING & CONSULTING PC

169 Commack Road, Suite H173, Commack, NY 11725
PHONE: (631) 629-5373 Info@tyllengineering.com

TITLE:

SUB-SLAB DEPRESSURIZATION DETAILS

1665 STILLWELL AVENUE
BROOKLYN, NEW YORK

DRAWN:

-

SCALE:

NTS

DATE:

2-16-2024

PROJECT NO.:

RSK2305

CHECKED:

KT

APPROVED:

KT

REVISION:

-

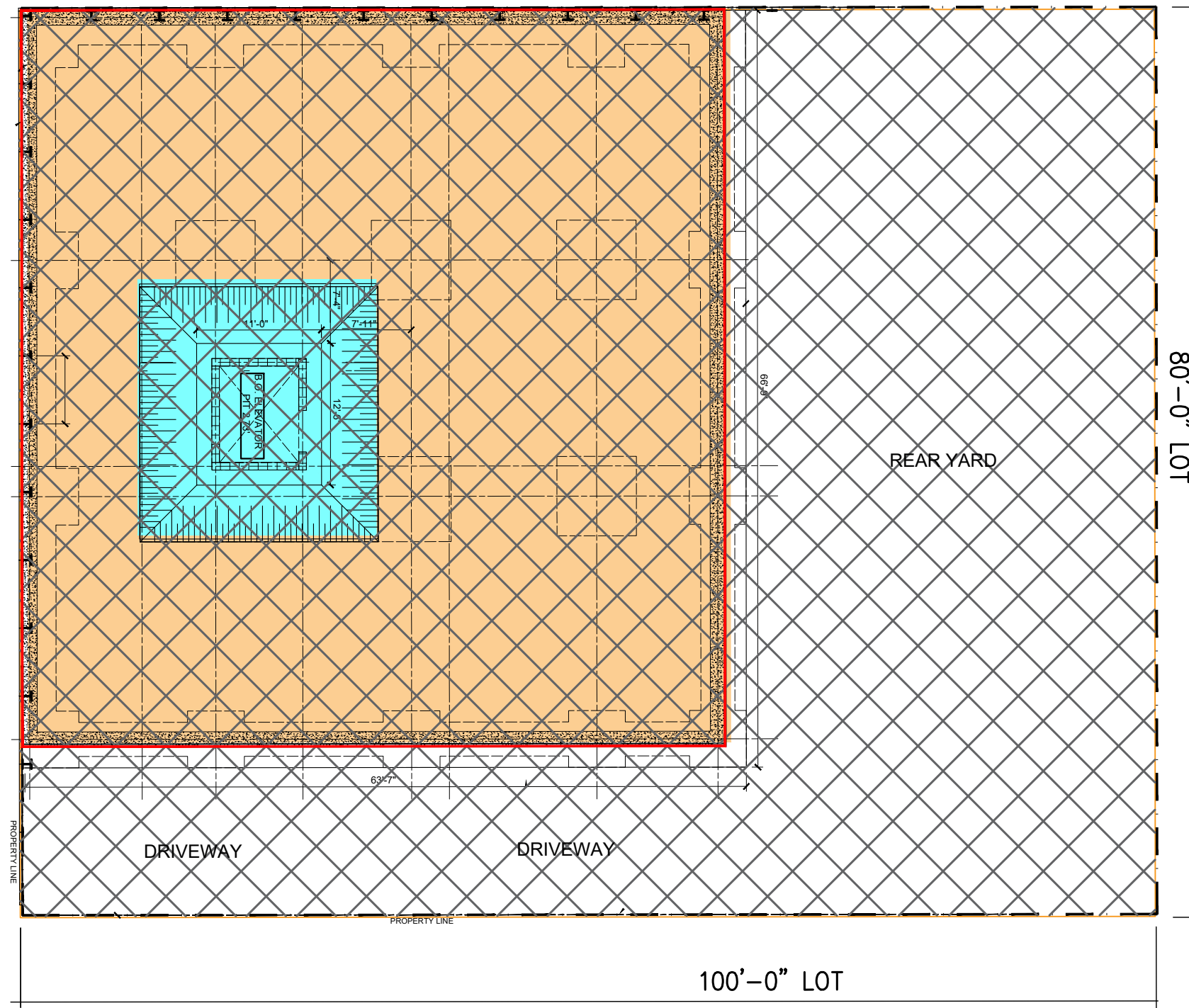
NOTES:

-

FIGURE NO.:






10 (B)

STILLWELL AVENUE



LEGEND

PROPOSED DEVELOPMENT EXCAVATIONS

-  -4' SITE-WIDE EXCAVATION
-  -12' NEW CELLAR EXCAVATION
-  -17' NEW ELEVATOR PIT EXCAVATION
-  PROPOSED CELLAR/BUILDING LINE
-  LOT LINE

PREPARED BY:



TYLL ENGINEERING & CONSULTING PC

169 Commack Road, Suite H173, Commack, NY 11725
PHONE: (631) 629-5373 info@tyllengineering.com

TITLE:

PROPOSED REDEVELOPMENT EXCAVATION PLAN

1665 STILLWELL AVENUE
BROOKLYN, NY

DRAWN:

-

SCALE:

NTS

DATE:

09/20/2024

PROJECT NO.:

CHECKED:

KT

APPROVED:

KT

REVISION:

-

NOTES:

-

FIGURE NO.:

11



**Tyll Engineering
And Consulting**

**ORGANIZATIONAL CHART FOR
1665 STILLWELL
AVENUE
BROOKLYN, NY
DEC #**

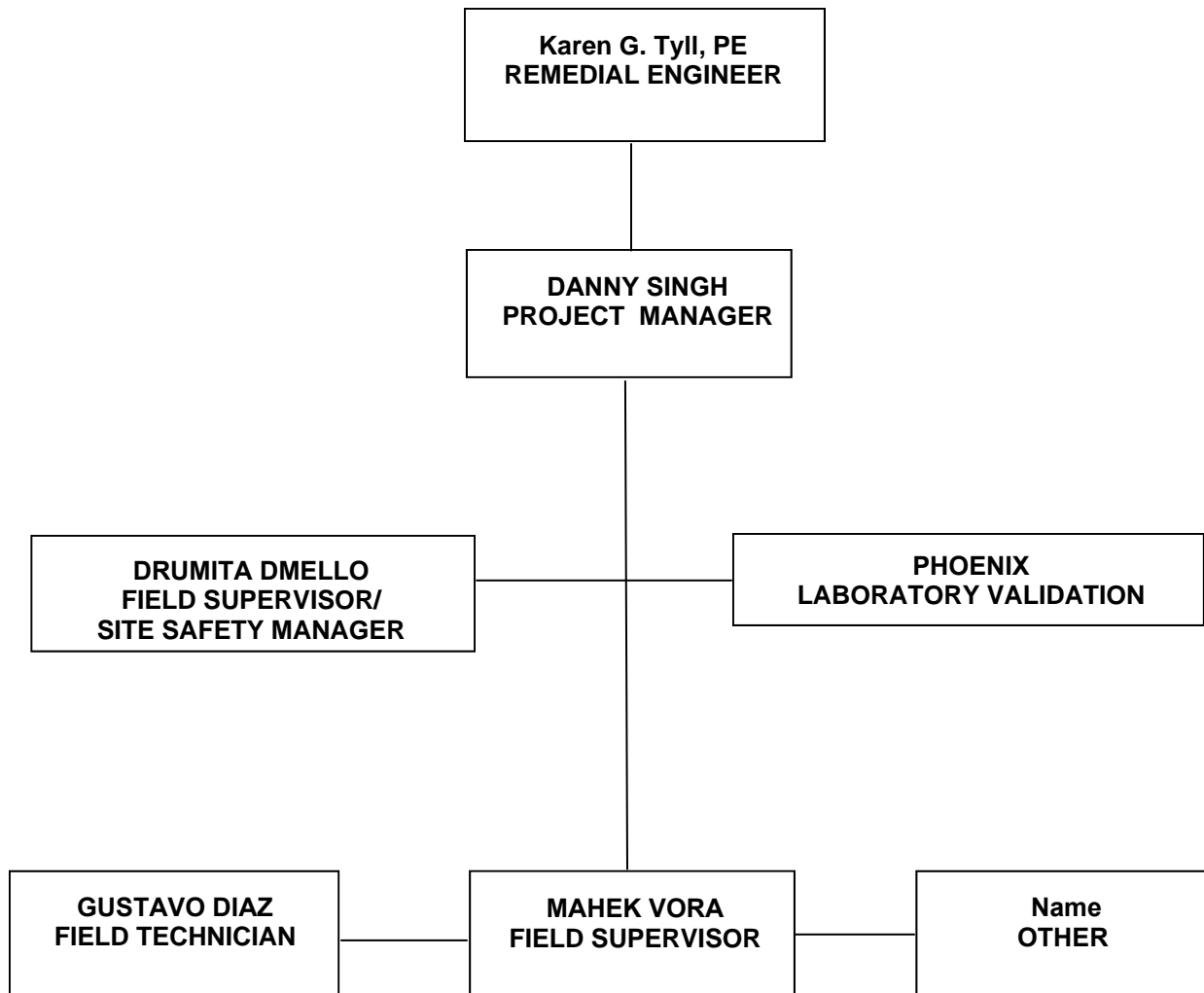
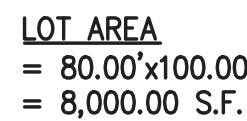


Figure 12

Appendix A

Proposed Development Plans



A diagram of a rectangular building footprint. The rectangle is oriented horizontally. To the left of the rectangle, a vertical dimension line with arrows at both ends is labeled "62.00'". Below the rectangle, a horizontal dimension line with arrows at both ends is labeled "65.00'". The rectangle itself is outlined in black.

PROPOSED CELLAR F.A.
(COMMERCIAL U.G. 6) (NOT F.A.)
65.00'x62.00'
= 4,030.00 S.F.

Figure 1: Plan view of the building footprint. The footprint is L-shaped, with a main rectangular section and a smaller rectangular section attached to the left side. The overall dimensions are 65.00' wide and 62.00' deep. The main section is 26.81' wide and 9.33' deep. The smaller section is 11.83' wide and 2.50' deep. The distance between the two sections is 16.04' wide and 12.50' deep. The total width is 65.00' and the total depth is 62.00'.

PROPOSED 1ST FLOOR F.A.
(COMMERCIAL U.G. 6)

$$(65.00' \times 62.00') - [(16.04' \times 12.50') + (26.81' \times 9.33') + (9.17' \times 5.50') + (11.83' \times 2.50')] = 3,499.35 \text{ S.F.}$$

DEDUCTION
D1 (CHASE) = $0.67' \times 7.17' = 4.80$ S.F.
D2 (CHASE) = $0.67' \times 7.17' = 4.80$ S.F.
D3 (MECH. ROOM) = $6.67' \times 8.92' = 59.50$ S.F.

TOTAL DEDUCTION
= 4.80+4.80+59.50 = 69.10 S.F.

TOTAL 1ST FLOOR F.A.
(COMMERCIAL U.G. 6)
3,499.35 - 69.10
= 3,430.25 S.F.

PROPOSED 1ST FLOOR F.A.
(RESIDENTIAL U.G. 2)
(16.04'x12.50')+(26.81'x9.33')
+(9.17'x5.50')+(11.83'x2.50')
= 530.65 S.F.

DEDUCTION
D1 (DAYLIGHT IN CORRIDOR, 50% DEDUCTION)
(AS PER ZR 28-14)

$$=[(4.56' \times 3.83') + (5.00' \times 42.10')]/2 = 113.98 \text{ S.F.}$$
D2 (DENSITY CORRIDOR, 50% DEDUCTION)
(AS PER ZR 28-31)

$$=[(4.56' \times 3.83') + (5.00' \times 42.10')]/2 = 113.98 \text{ S.F.}$$
D3 (CHASE) = 2.00' x 2.00' = 4.00 S.F.

TOTAL DEDUCTION
= 113.98+113.98+4.00 = 231.96 S.F.

TOTAL 1ST FLOOR F.A.
(RESIDENTIAL U.G. 2)
530.65 - 231.96
= 298.69 S.F.

[illegible]

**PROPOSED 2ND FLOOR THRU 4TH FLOOR F.A.
PER FLOOR AREA (RESIDENTIAL U.G. 2)**
(65.00'X46.33')+(23.25'X5.00')+(23.25'X5.00')
= 3,243.95 S.F.

DEDUCTION
D1 (DENSITY CORRIDOR, 50% DEDUCTION)
(AS PER ZR 28-31)
 $= (5.00' \times 24.67') / 2 = 61.68 \text{ S.F.}$
D2 (CHASE) $= 2.00' \times 2.00' = 4.00 \text{ S.F.}$
D3 (REFUSE ROOM)
(DEDUCT 12 S.F. AS PER ZR 28-12)
 $= 12.00 \text{ S.F.}$
D4 (CHASE) $= (2.50' \times 1.50') + (7.50' \times 0.50') = 7.50 \text{ S.F.}$
D5 (CHASE) $= 18.17' \times 0.00' = 18.17 \text{ S.F.}$
D6 (CHASE) $= (2.50' \times 1.50') + (6.67' \times 0.50') = 7.09 \text{ S.F.}$
D7 (CHASE) $= (2.50' \times 1.50') + (7.50' \times 0.50') = 7.50 \text{ S.F.}$
D8 (CHASE) $= 18.17' \times 0.00' = 18.17 \text{ S.F.}$
D9 (CHASE) $= (2.50' \times 1.50') + (6.67' \times 0.50') = 7.09 \text{ S.F.}$

TOTAL DEDUCTION
 = 61.68+4.00+12.00+7.50+18.17+7.09+7.50+18.17+7.09
 = 143.20 S.F.

TOTAL 2ND FLOOR THRU 4TH FLOOR F.A.
PER FLOOR AREA (RESIDENTIAL U.G. 2)
3,243.95 - 143.20
= 3,100.75 S.F.

PROPOSED 5TH FLOOR F.A.
(RESIDENTIAL U.G. 2)
(65.00'X41.33')+(32.50'X10.00')
= 3,011.45 S.F.


DEDUCTION
D1 (DENSITY CORRIDOR, 50% DEDUCTION)
 (AS PER ZR 28-31)
 $= (5.00' \times 24.67') / 2 = 61.68 \text{ S.F.}$
D2 (CHASE) $= 2.00' \times 2.00' = 4.00 \text{ S.F.}$
D3 (REFUSE ROOM)
 (DEDUCT 12 S.F. AS PER ZR 28-12)
 $= 12.00 \text{ S.F.}$
D4 (CHASE) $= (2.50' \times 1.50') + (7.50' \times 0.50') = 7.50 \text{ S.F.}$
D5 (CHASE) $= 18.17' \times 1.00' = 18.17 \text{ S.F.}$
D6 (CHASE) $= (2.50' \times 1.50') + (6.67' \times 0.50') = 7.09 \text{ S.F.}$
D7 (CHASE) $= (2.50' \times 1.50') + (7.50' \times 0.50') = 7.50 \text{ S.F.}$
D8 (CHASE) $= 9.00' \times 1.00' = 9.00 \text{ S.F.}$
D9 (CHASE) $= 8.67' \times 0.33' = 2.86 \text{ S.F.}$

TOTAL DEDUCTION
= 61.68+4.00+12.00+7.50+18.17+7.09+7.50+9.00+2.86
= 129.80 S.F.

TOTAL 5TH FLOOR F.A.
(RESIDENTIAL U.G. 2)
3,011.45 - 129.80
= 2,881.65 S.F.

Floor plan of the second floor showing a Stair & Elevator Bulk area and a Mech. Room area. The total width is 46.00' and the total height is 35.00'. The Stair & Elevator Bulk area is 25.17' wide and 22.00' high. The Mech. Room area is 20.83' wide and 35.00' high.

PROPOSED BULKHEAD FLOOR F.A.
(RESIDENTIAL U.G. 2) (NOT F.A.)
(25.17'X22.00')+(20.83'X35.00')
= 1,282.79 S.F.

LEGEND:  PROPOSED FLOOR AREA  NOT FLOOR AREA	<u>TOTAL LOT AREA</u>		= 8,000.00 S.F.
	<u>TOTAL COMMERCIAL AREA (U.G.6)</u>	= 1ST FL.	= 3,430.25 S.F.
	<u>TOTAL RESIDENTIAL AREA (U.G. 2)</u>	= 1ST FL. + 2ND FL. + 3RD FL. + 4TH FL. + 5TH FL. = 298.69 + 3,100.75 + 3,100.75 + 3,100.75 + 2,881.65	= 12,482.59 S.F.
	<u>TOTAL FLOOR AREA</u>	= COMMERCIAL + RESIDENTIAL = 3,430.25 + 12,482.59	= 15,912.84 S.F.

STRUCTURAL ENGINEER

PROJECT

NEW BUILDING

1665 STILLWELL AVENUE
BROOKLYN NY 11223

DRAWING TITLE

ZONING ANALYSIS BUILDING DIAGRAMS

REVISIONS

[illegible]

ISSUED

The reproduction of this drawing or the use of ideas and arrangements indicated on this drawing without the written approval of this office is prohibited. Written dimensions take precedence over scaled dimensions. The contractor shall verify dimensions and conditions at the job and report discrepancies to the Architect prior to the start of the work.

Proj. No.	18-1665
Date	12-12-18
Scale	AS NOTED

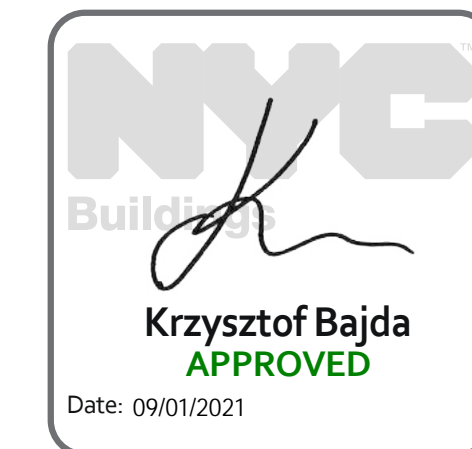
Drawn

SEAL DRAWING NUMBER

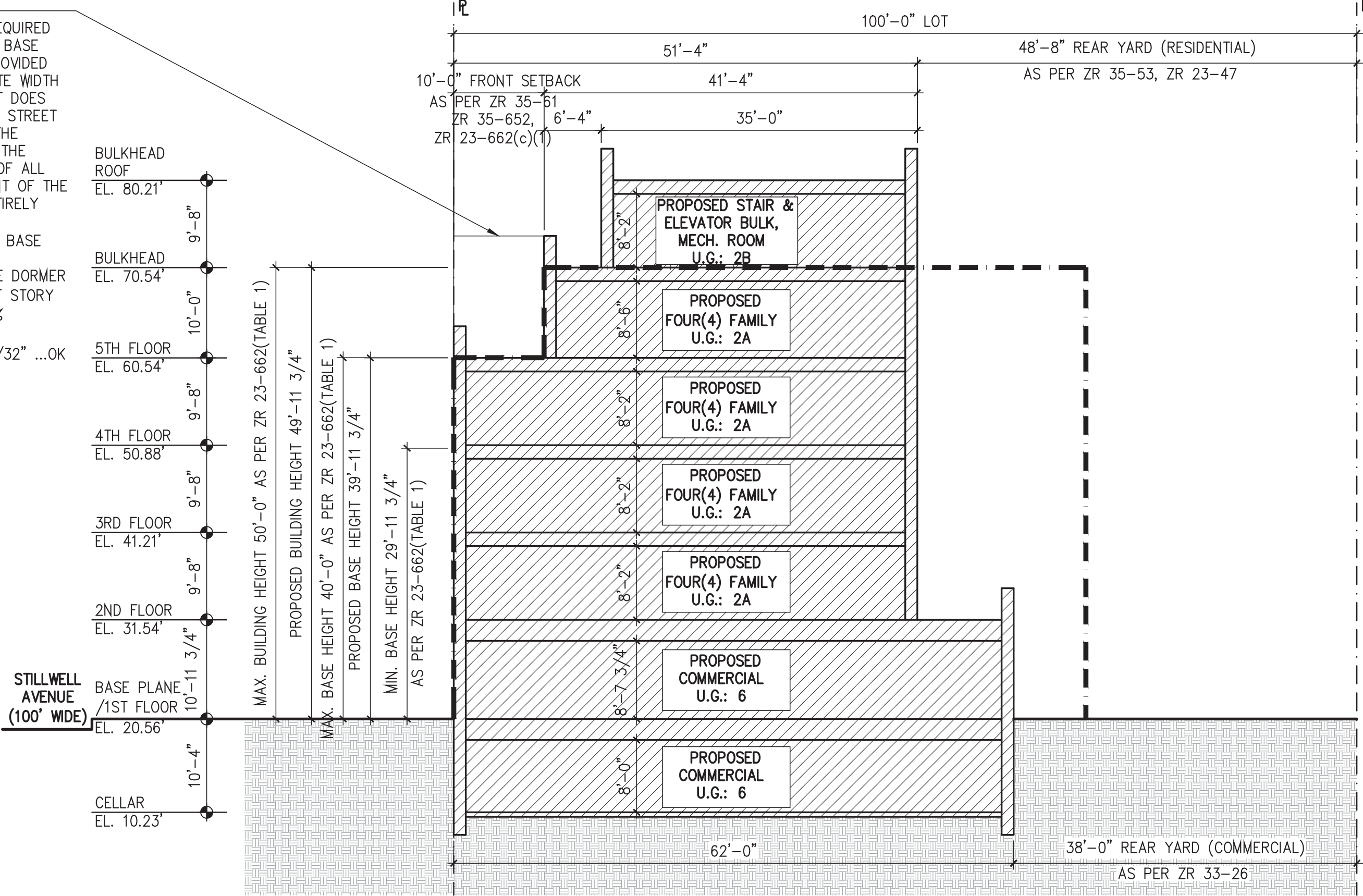
REG. YING HAO LI ECT Z-002.00

SHEET 2 OF 25

DOB STAMP



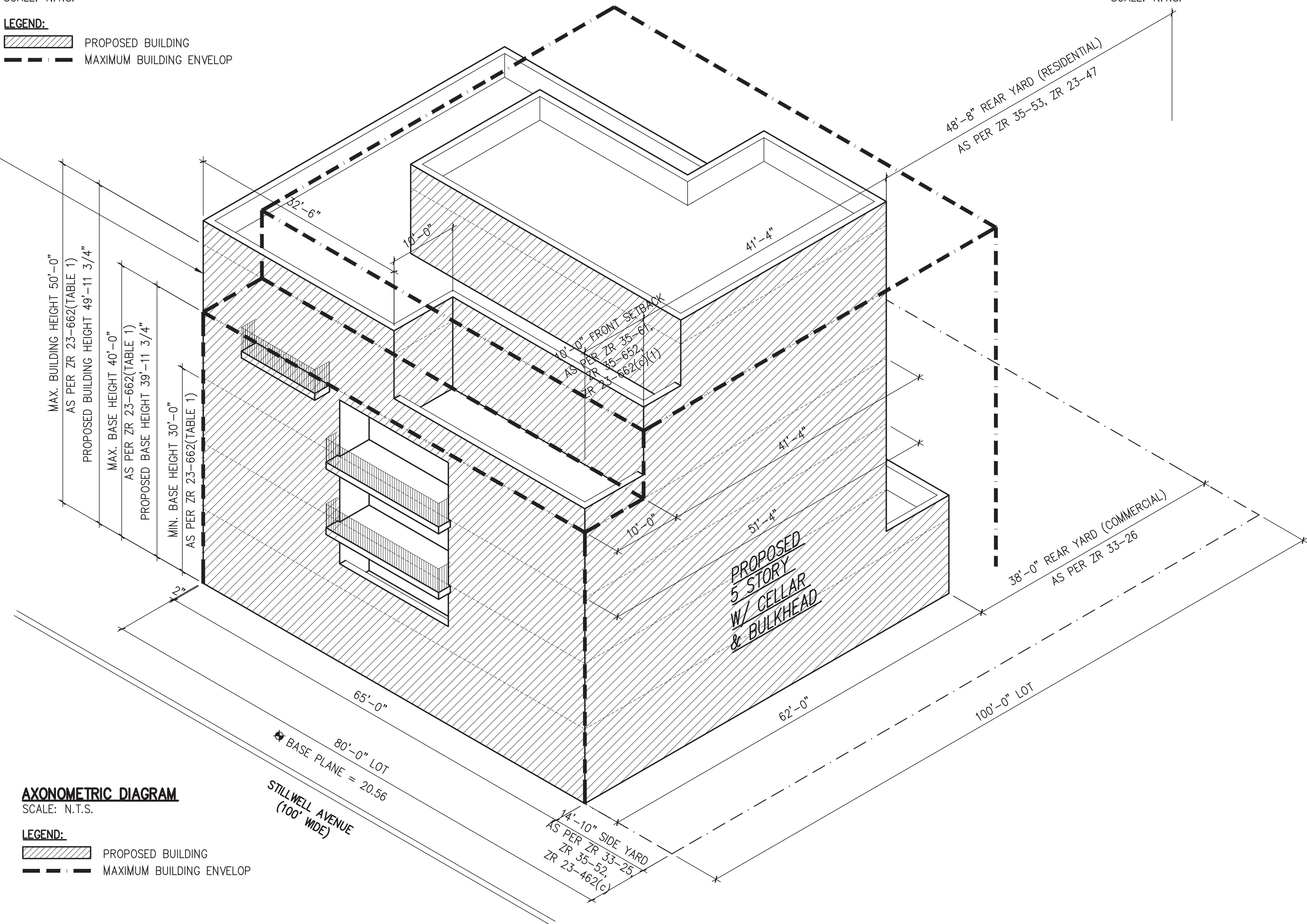
AS PER ZR 23-621(c)(1)
FOR QUALITY HOUSING BUILDINGS, WITHIN THE REQUIRED FRONT SETBACK DISTANCE ABOVE THE MAXIMUM BASE HEIGHT, DORMER IS PERMITTED OBSTRUCTION, PROVIDED THAT ON ANY STREET FRONTAGE, THE AGGREGATE WIDTH OF ALL DORMERS AT THE MAXIMUM BASE HEIGHT DOES NOT EXCEED 60 PERCENT OF THE WIDTH OF THE STREET WALL OF THE HIGHEST STORY ENTIRELY BELOW THE MAXIMUM BASE HEIGHT. FOR EACH FOOT ABOVE THE MAXIMUM BASE HEIGHT, THE AGGREGATE WIDTH OF ALL DORMERS SHALL BE DECREASED BY ONE PERCENT OF THE STREET WALL WIDTH OF THE HIGHEST STORY ENTIRELY BELOW THE MAXIMUM BASE HEIGHT.
PROPOSED DORMER 9'-11 3/4" ABOVE MAXIMUM BASE HEIGHT.
THEREFORE, THE MAX. AGGREGATE WIDTH OF THE DORMER = 60%-(9.98 X 1%) = 50.02% OF THE WIDTH OF STORY BELOW. MAX. DORMER WIDTH = 65'-0" X 50.02% = 32'-6 5/32"
PROPOSED DORMER WIDTH = 32'-6" < 32'-6 5/32" ...OK



PROPOSED A-A BUILDING DIAGRAM
SCALE: N.T.S.

LEGEND:
[Hatched Box] PROPOSED BUILDING
[Dashed Line] MAXIMUM BUILDING ENVELOP

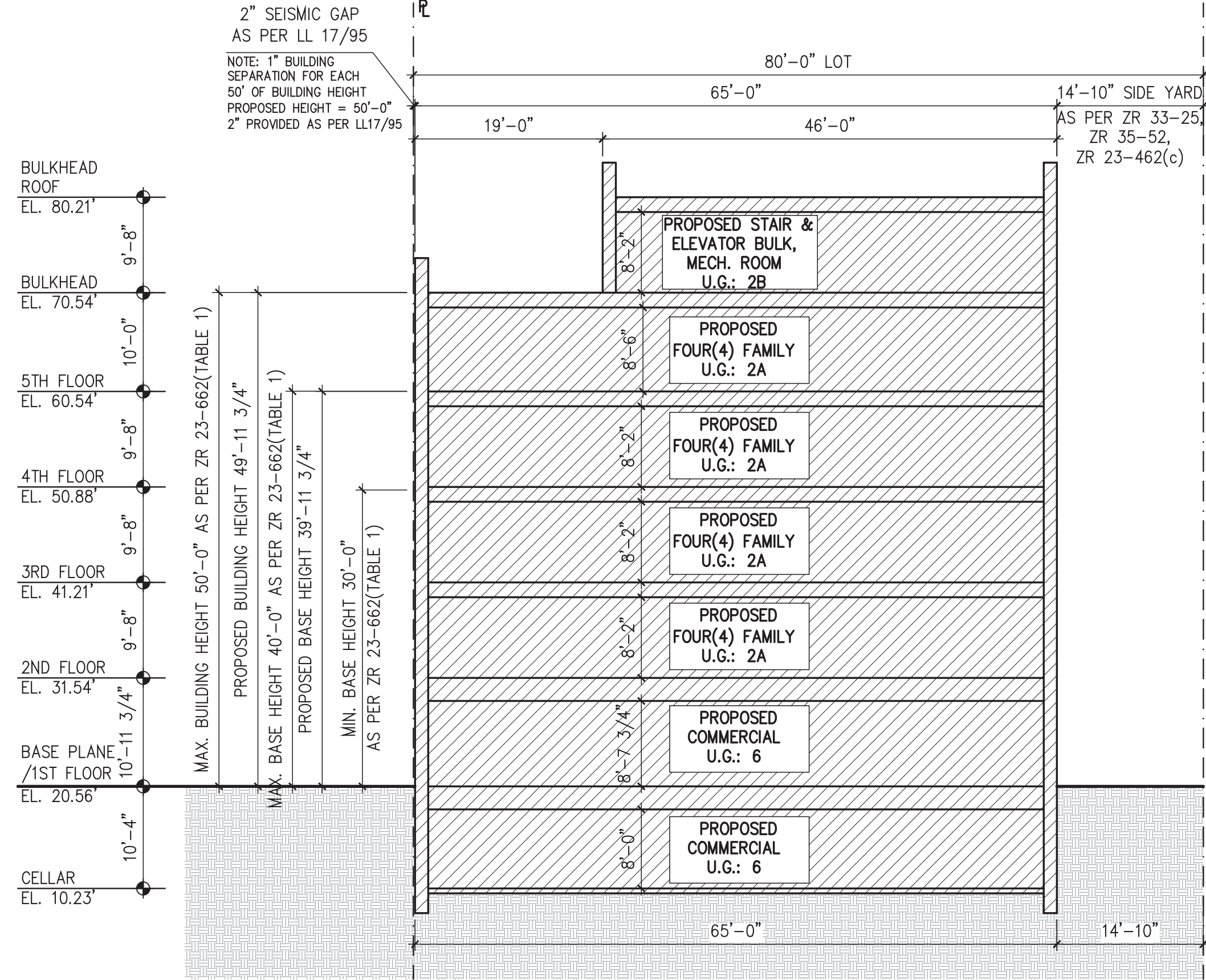
AS PER ZR 23-621(c)(1)
FOR QUALITY HOUSING BUILDINGS, WITHIN THE REQUIRED FRONT SETBACK DISTANCE ABOVE THE MAXIMUM BASE HEIGHT, DORMER IS PERMITTED OBSTRUCTION, PROVIDED THAT ON ANY STREET FRONTAGE, THE AGGREGATE WIDTH OF ALL DORMERS AT THE MAXIMUM BASE HEIGHT DOES NOT EXCEED 60 PERCENT OF THE WIDTH OF THE STREET WALL OF THE HIGHEST STORY ENTIRELY BELOW THE MAXIMUM BASE HEIGHT. FOR EACH FOOT ABOVE THE MAXIMUM BASE HEIGHT, THE AGGREGATE WIDTH OF ALL DORMERS SHALL BE DECREASED BY ONE PERCENT OF THE STREET WALL WIDTH OF THE HIGHEST STORY ENTIRELY BELOW THE MAXIMUM BASE HEIGHT.
PROPOSED DORMER 9'-11 3/4" ABOVE MAXIMUM BASE HEIGHT.
THEREFORE, THE MAX. AGGREGATE WIDTH OF THE DORMER = 60%-(9.98 X 1%) = 50.02% OF THE WIDTH OF STORY BELOW. MAX. DORMER WIDTH = 65'-0" X 50.02% = 32'-6 5/32"
PROPOSED DORMER WIDTH = 32'-6" < 32'-6 5/32" ...OK



AXONOMETRIC DIAGRAM
SCALE: N.T.S.

LEGEND:
[Hatched Box] PROPOSED BUILDING
[Dashed Line] MAXIMUM BUILDING ENVELOP

2" SEISMIC GAP
AS PER LL 17/95
NOTE: 1" BUILDING SEPARATION FOR EACH 50' OF BUILDING HEIGHT
PROPOSED HEIGHT = 50'-0"
2" PROVIDED AS PER LL17/95



PROPOSED B-B BUILDING DIAGRAM
SCALE: N.T.S.

NOTE: BUILDING DIAGRAMS ARE DIAGRAMMATIC AND TO SHOW COMPLIANCE WITH ZONING REGULATIONS ONLY.
NOT FOR CONSTRUCTION.

DRAWING INDEX			
PAGE	DRAWING TITLE	DATE	SHEET No.
Z-001.00	ZONING ANALYSIS & PLOT PLAN	12-12-18	01
Z-002.00	ZONING CALCULATION	12-12-18	02
Z-003.00	BUILDING DIAGRAMS AND NOTES	12-12-18	03
G-001.00	GENERAL NOTES	12-12-18	04
G-002.00	GENERAL NOTES	12-12-18	05
G-003.00	GENERAL NOTES	12-12-18	06
A-101.00	PROPOSED CELLAR FLOOR PLAN	12-12-18	07
A-102.00	PROPOSED 1ST FLOOR PLAN	12-12-18	08
A-103.00	PROPOSED 2ND FLOOR PLAN	12-12-18	09
A-104.00	PROPOSED 3RD THRU 4TH FLOOR PLANS	12-12-18	10
A-005.00	PROPOSED 5TH FLOOR PLAN	12-12-18	11
A-106.00	PROPOSED ROOF PLANS	12-12-18	12
A-201.00	BUILDING ELEVATIONS	12-12-18	13
A-202.00	BUILDING ELEVATIONS	12-12-18	14
A-301.00	BUILDING SECTIONS	12-12-18	15
A-401.00	ADA DETAILS	12-12-18	16
A-402.00	DETAILS	12-12-18	17
A-501.00	DOOR AND WINDOW SCHEDULE	12-12-18	18
RCP-001.00	PROPOSED REFLECTIVE CEILING PLANS	12-12-18	19
RCP-002.00	PROPOSED REFLECTIVE CEILING PLANS	12-12-18	20
RCP-003.00	PROPOSED REFLECTIVE CEILING PLANS	12-12-18	21
RCP-004.00	LIGHTING ANALYSIS AND NOTES	12-12-18	22
EN-001.00	ENERGY ANALYSIS	12-12-18	23
EN-002.00	ENERGY ANALYSIS	12-12-18	24
EN-003.00	ENERGY ANALYSIS	12-12-18	25

ARCHITECT
**CITY BUILDING NY
ARCHITECT P.C.**
802 64th Street, #3
Brooklyn, NY 11220
Tel.: (718) 836-1828
Fax.: (718) 836-1707
8361828@gmail.com

STRUCTURAL ENGINEER

PROJECT

NEW BUILDING

1665 STILLWELL AVENUE
BROOKLYN NY 11223

DRAWING TITLE

**ZONING ANALYSIS
BUILDING DIAGRAMS**

REVISIONS

NO.	DATE	DESCRIPTION

NO.	DATE	ISSUED TO

ISSUED

The reproduction of this drawing or the use of ideas and arrangements indicated on this drawing without the written approval of this office is prohibited. Written dimensions take precedence over scaled dimensions. The contractor shall verify dimensions and conditions at the job and report discrepancies to the Architect prior to the start of the work.

Proj. No. 18-1665
Date 12-12-18
Scale AS NOTED

Drawn

SEAL

REGISTERED ARCHITECT
Hao Li

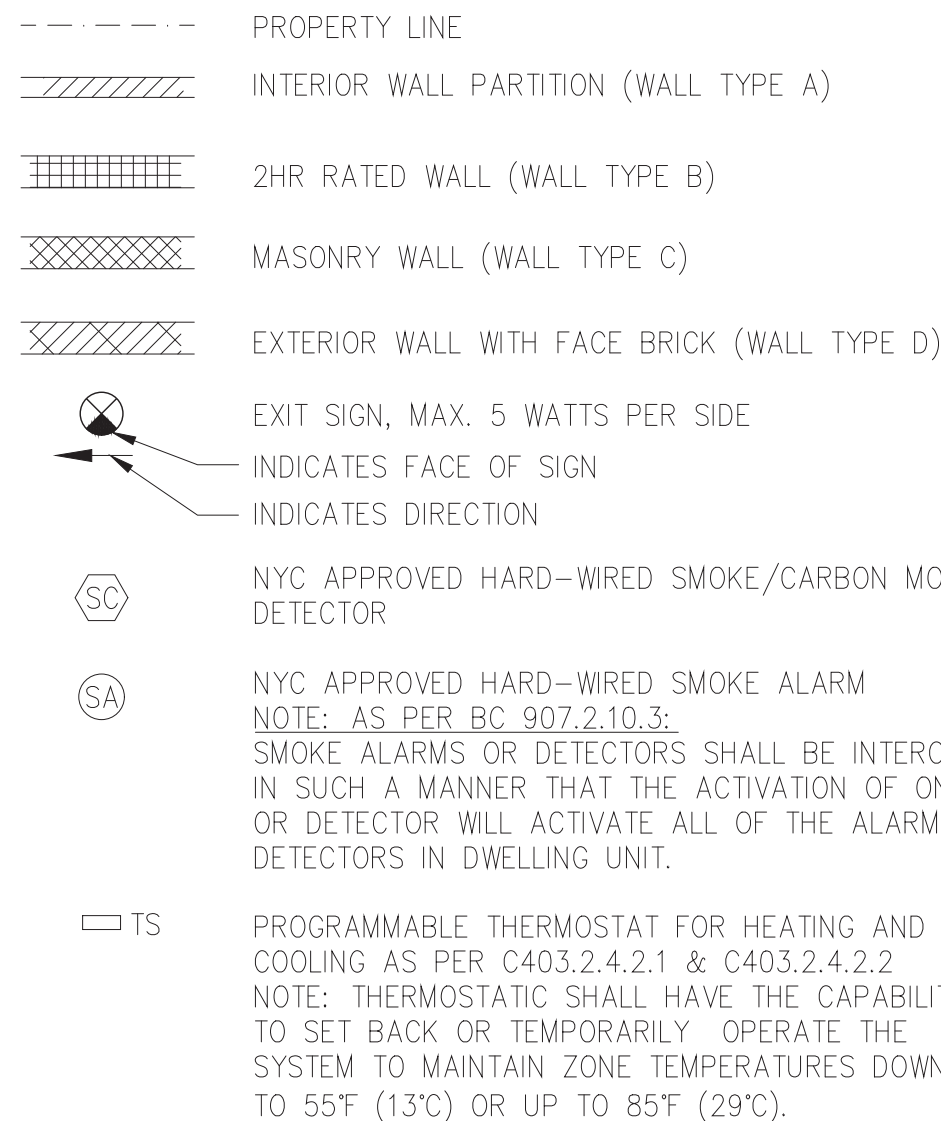
DRAWING NUMBER
Z-003.00

SHEET 3 OF 25

Client and affix BIS job number label here

DOB STAMP

NMC
Building
Krzysztof Bajda
APPROVED
Date: 09/01/2021



ARCHITECT

**CITY BUILDING NY
ARCHITECT P.C.**
802 64th Street, #3
Brooklyn, NY 11220
Tel.: (718) 836-1828
Fax.: (718) 836-1707
8361828@gmail.com

STRUCTURAL ENGINEER

PROJECT

NEW BUILDING

1665 STILLWELL AVENUE
BROOKLYN NY 11223

DRAWING TITLE

PROPOSED FLOOR PLANS

REVISIONS

[illegible]

ISSUED

The reproduction of this drawing or the use of ideas and arrangements indicated on this drawing without the written approval of this office is prohibited. Written dimensions take precedence over scaled dimensions. The contractor shall verify dimensions and conditions at the job and report discrepancies to the Architect prior to the start of the work.

Proj. No. 18-1665

Date 12-12-18

Scale AS NOTED

Drawn

SEAL

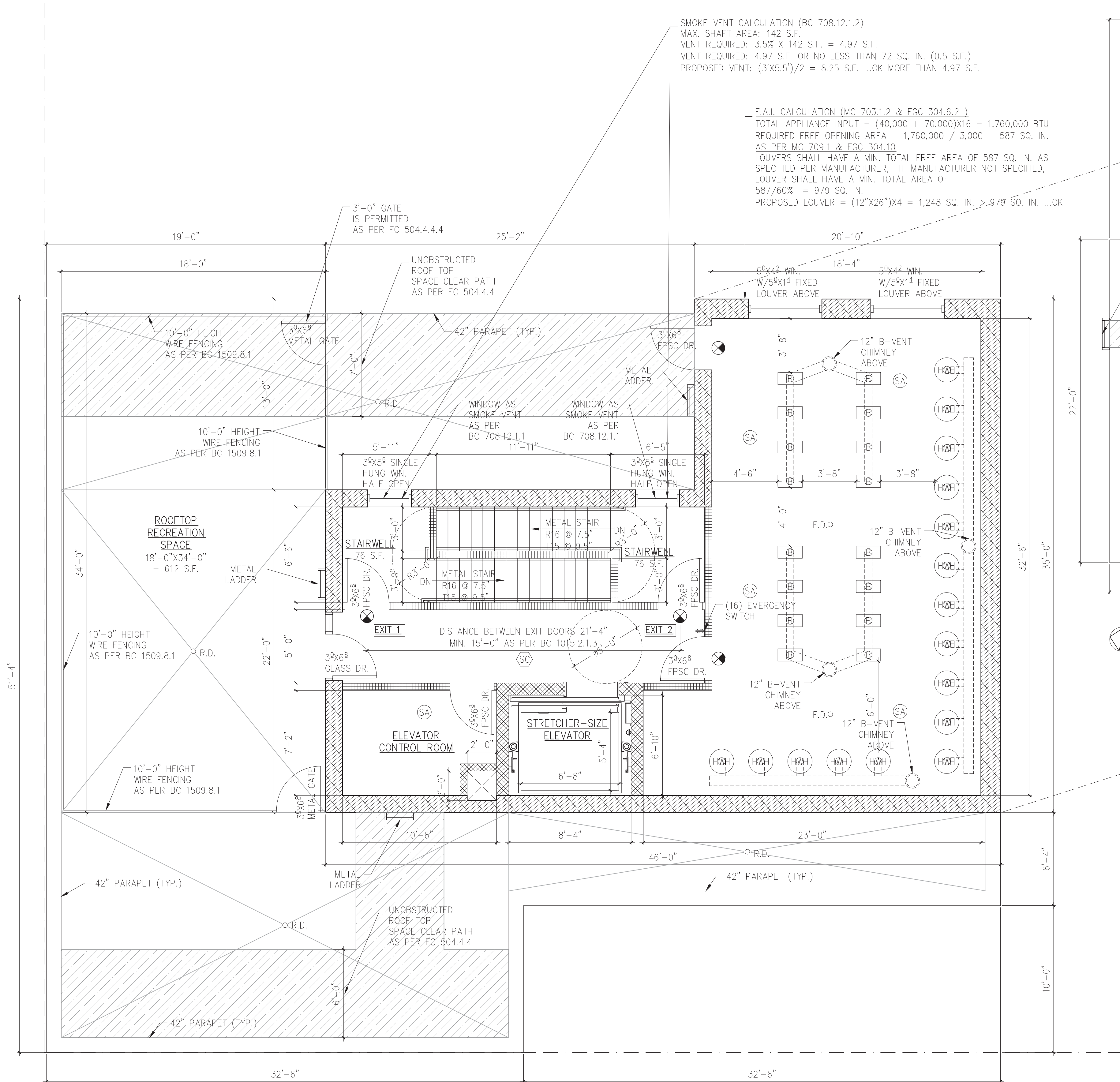
DRAWING NUMBER


A-106.00

SHEET 12 OF 32

 Orient and affix BIS

DOB STAMP



 **PROPOSED BULKHEAD FLOOR PLAN**
SCALE: 1/4" = 1'-0"

NOTE: ALL FPSC DOOR SHALL BE 1 1/2 HOUR FIRE RATED UNLESS OTHERWISE NOTED.

EQUIPMENT SCHEDULE									
ITEM	MANUFACTURER	MODEL NO.	CAPACITY	CAPACITY BTUH		ENERGY RATING	TESTING STANDARD	QUANTITY	REMARK
				INPUT	OUTPUT				
HOT WATER HEATER (GAS)	A.O. SMITH	XCG-50	50 GALLON	40,000 BTU	N/A	60% EF	ANSI Z21.10.1/CSA 4.1-2014	16	WATER HEATER IS EQUIPED WITH BUILT-IN HEAT TRAP IN THE INLET AND OUTLET CONNECTIONS. WATER HEATER IS SERVING NON-CIRCULATING SYSTEM, NO CIRCULATION PUMP REQUIRED.
BOILER (GAS)	WEIL MC LAIN	CGA-3	N/A	70,000 BTU	59,000 BTU	84% AFUE	ANSI Z21.13-2013/ CSA 4.9-2013	16	

NOTE

1. WATER HEATING EQUIPMENT SHALL BE PROVIDED WITH CONTROLS TO ALLOW A SET POINT OF 110°F (43°C) FOR EQUIPMENT SERVING DWELLING UNITS.
2. OPERATING AND MAINTENANCE MANUALS ARE TO BE PROVIDED TO THE BUILDING OWNER BY THE MECHANICAL CONTRACTOR WITHIN 90 DAYS OF ISSUANCE OF THE CERTIFICATE OF OCCUPANCY.

NOTE: AS PER NYCECC C408.2 COMMISSIONING AND COMPLETION REQUIREMENT,
COMMISSIONING IS REQUIRED FOR THE SERVICE WATER HEATING SYSTEM(INCLUDING BOILER).

OWNER/G.C. SHALL RETAIN APPROVED COMMISSIONING AGENCY TO PERFORM THE COMMISSIONING AS PER NYCECC C408.2, AND PREPARE THE REQUIRED REPORTS AND SUBMIT TO BUILDINGS DEPARTMENT AS REQUIRED.

SYSTEM BALANCING REPORT

- HVAC/SWH SYSTEMS ARE REQUIRED TO BE TESTED, ADJUSTED AND BALANCED IN ACCORDANCE WITH ASHRAE 111 OR OTHER APPROVED STANDARDS.
- SUBSEQUENTLY, WITHIN 90 DAYS OF THE ISSUANCE OF THE CERTIFICATE OF OCCUPANCY, THE SYSTEM BALANCING REPORT DESCRIBING THE COMPLETED ACTIVITIES AND MEASUREMENTS MUST BE PROVIDED TO THE BUILDING OWNER.

FINAL COMMISSIONING REPORT

- FINAL COMMISSIONING REPORT IS TO BE PROVIDED TO THE BUILDING OWNER, AND
- THE COMMISSIONING REPORT CERTIFICATION MUST BE SUBMITTED TO THE DEPARTMENT:

- WITHIN 30 MONTHS OF THE ISSUANCE OF THE C/O OR LETTER OF COMPLETION FOR NEW BUILDINGS GREATER OR EQUAL 500,000 S.F. IN CONDITIONED SPACE AREA, EXCLUDING R-2 OCCUPANCIES; AND
- WITHIN 18 MONTHS OF THE ISSUANCE OF THE C/O OR LETTER OF COMPLETION FOR ALL OTHER BUILDINGS.



**CITY BUILDING NY
ARCHITECT P.C.**
802 64th Street, #3
Brooklyn, NY 11220
Tel.: (718) 836-1828
Fax.: (718) 836-1707
8361828@gmail.com

NEW BUILDING

PROPOSED ELEVATIONS

ISSUED

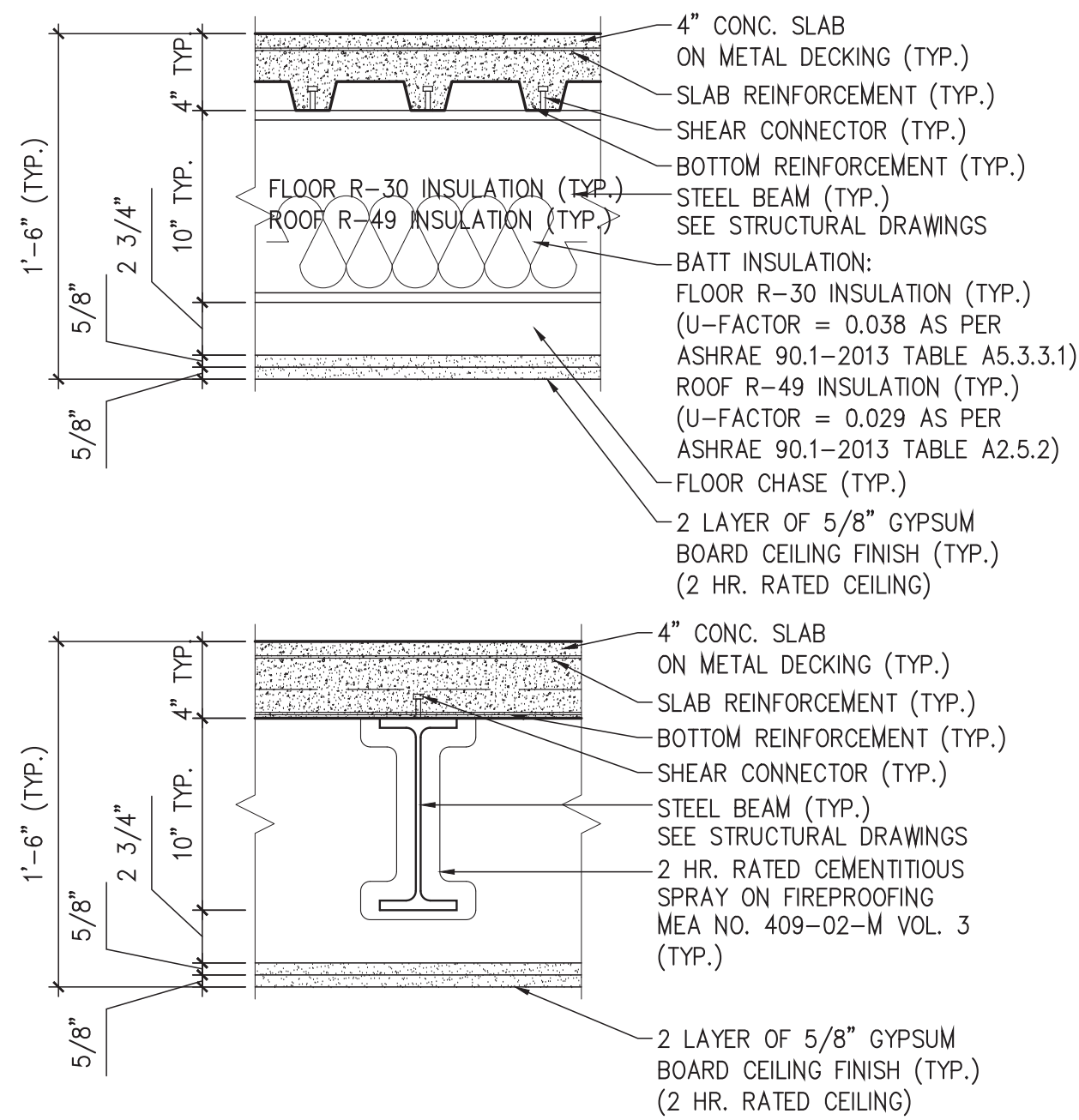
A-202.00

 Orient and affix BIS
job number label here 


Krzysztof Bajda
APPROVED
Date: 09/01/2021



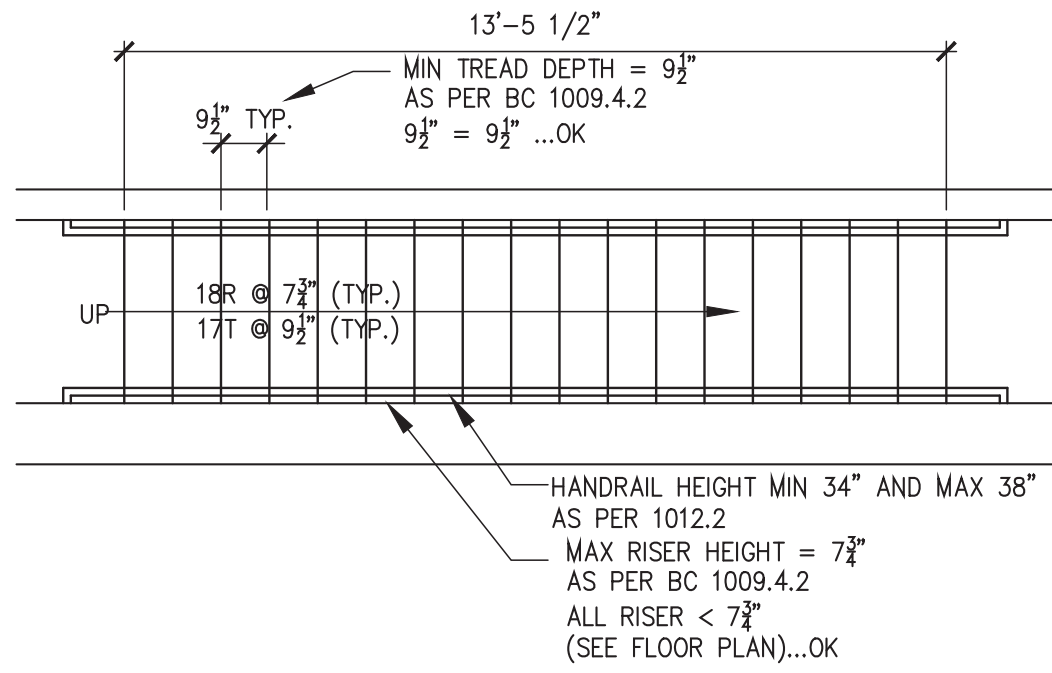

Krzysztof Bajda
APPROVED
Date: 09/01/2021



FLOOR AND CEILING DETAILS

(MIN. 2 HR. RATED FOR IB AS PER TABLE 601)
UL NUMBER: D502

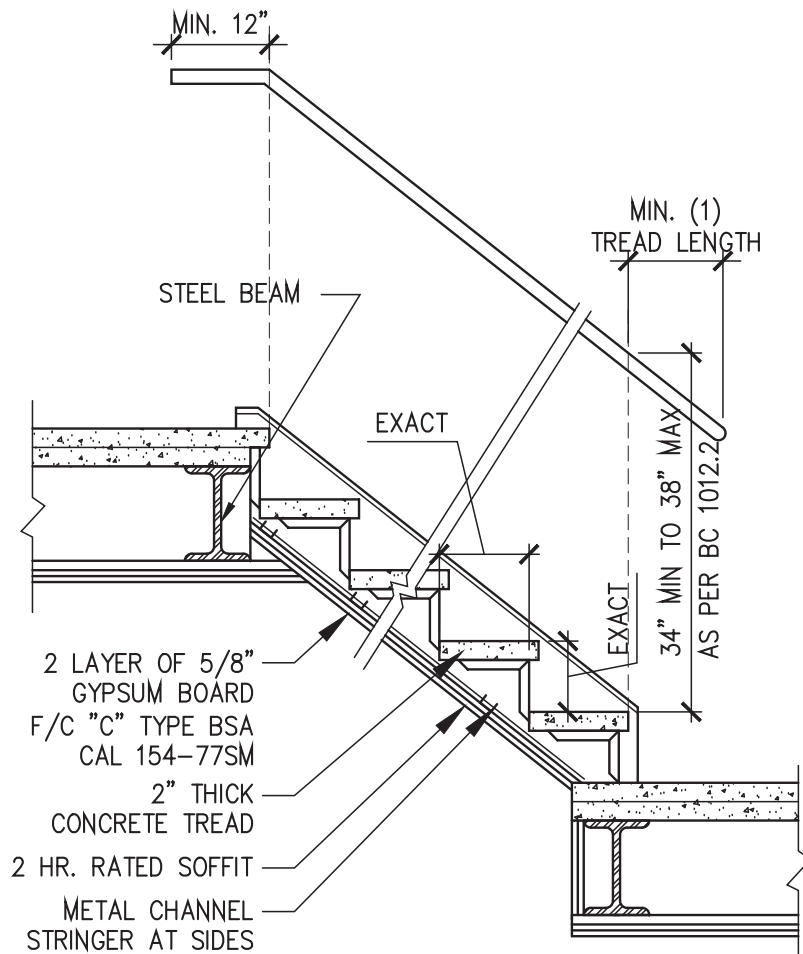
SCALE: N.T.S.



TYPICAL STAIR DETAIL (AS PER BC 1009)

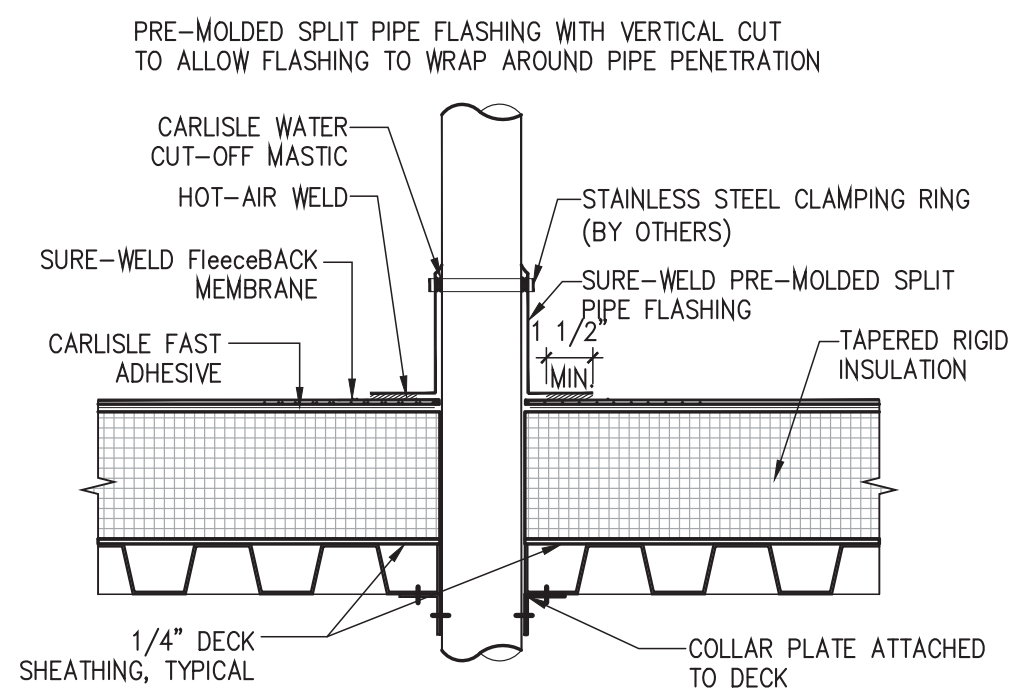
SCALE: N.T.S.

SUM OF TREAD AND TWO RISER SHALL BE NOT LESS THAN 24 INCHES NOR MORE THAN 25.5 INCHES AS PER BC 1009.4.2
ALL STAIR MEET THE REQUIREMENT (SEE FLOOR PLAN) ... OK



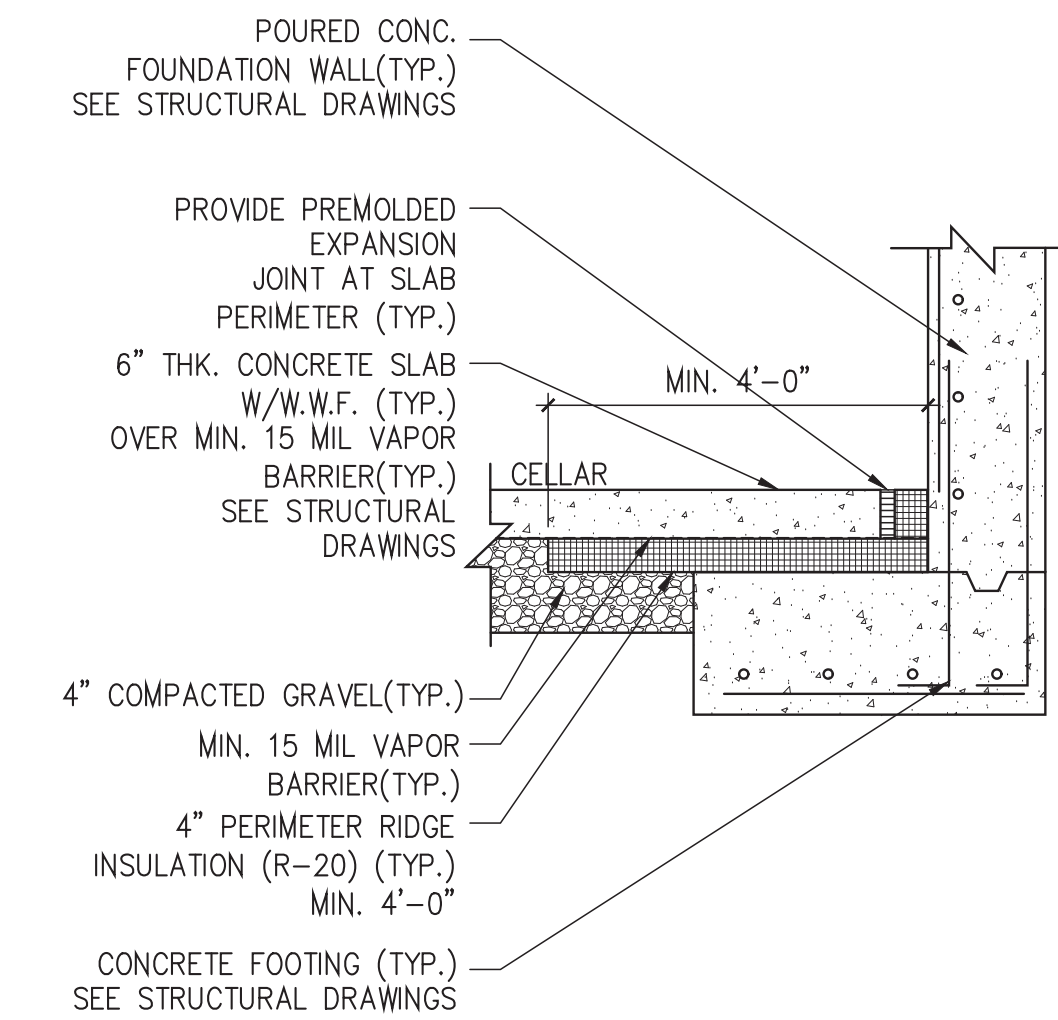
TYPICAL STAIR DETAIL (AS PER BC 1009)

SCALE: N.T.S.



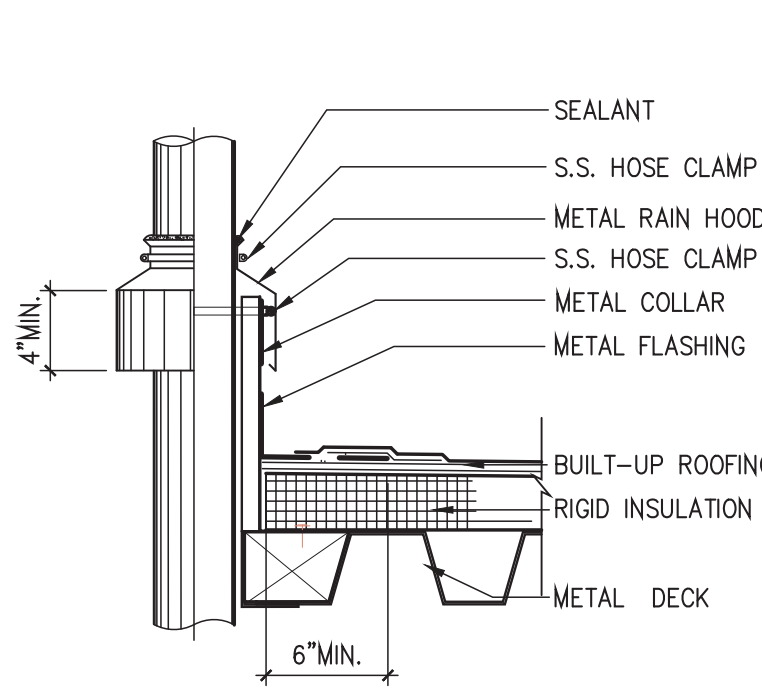
COLD SPLIT PIPE FLASHING

SCALE: N.T.S.



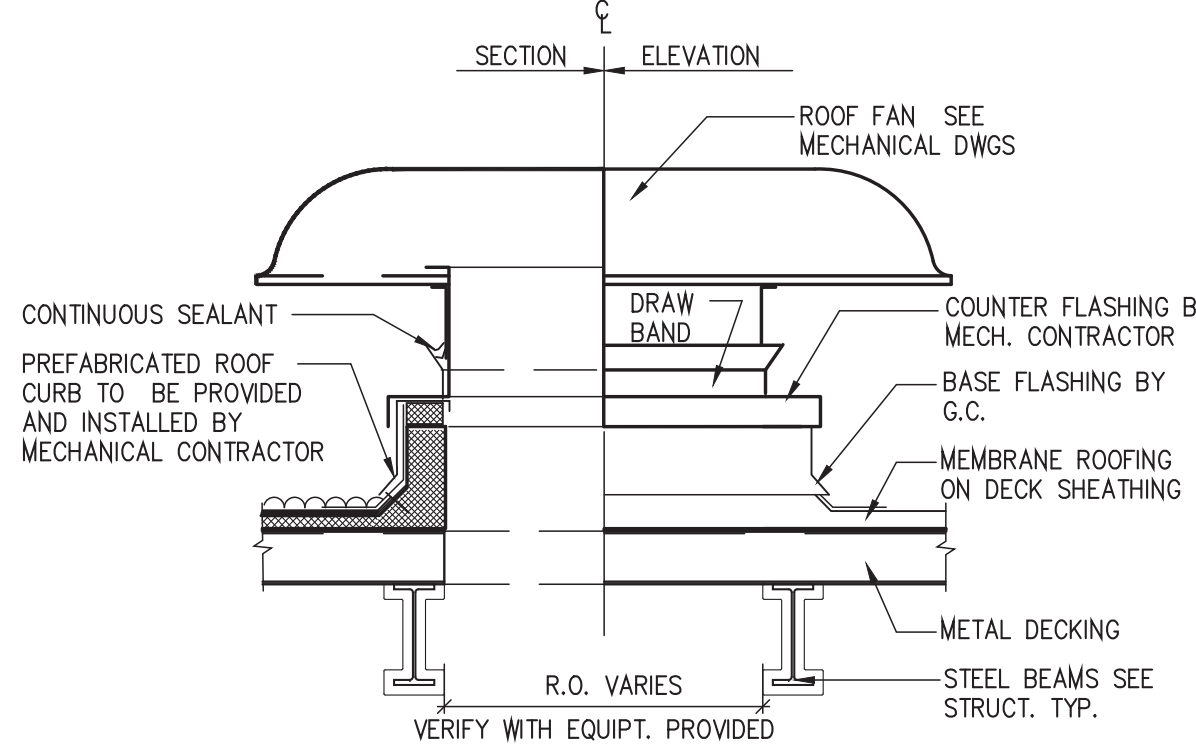
FOOTING DETAIL (TYP.)

SCALE: N.T.S.



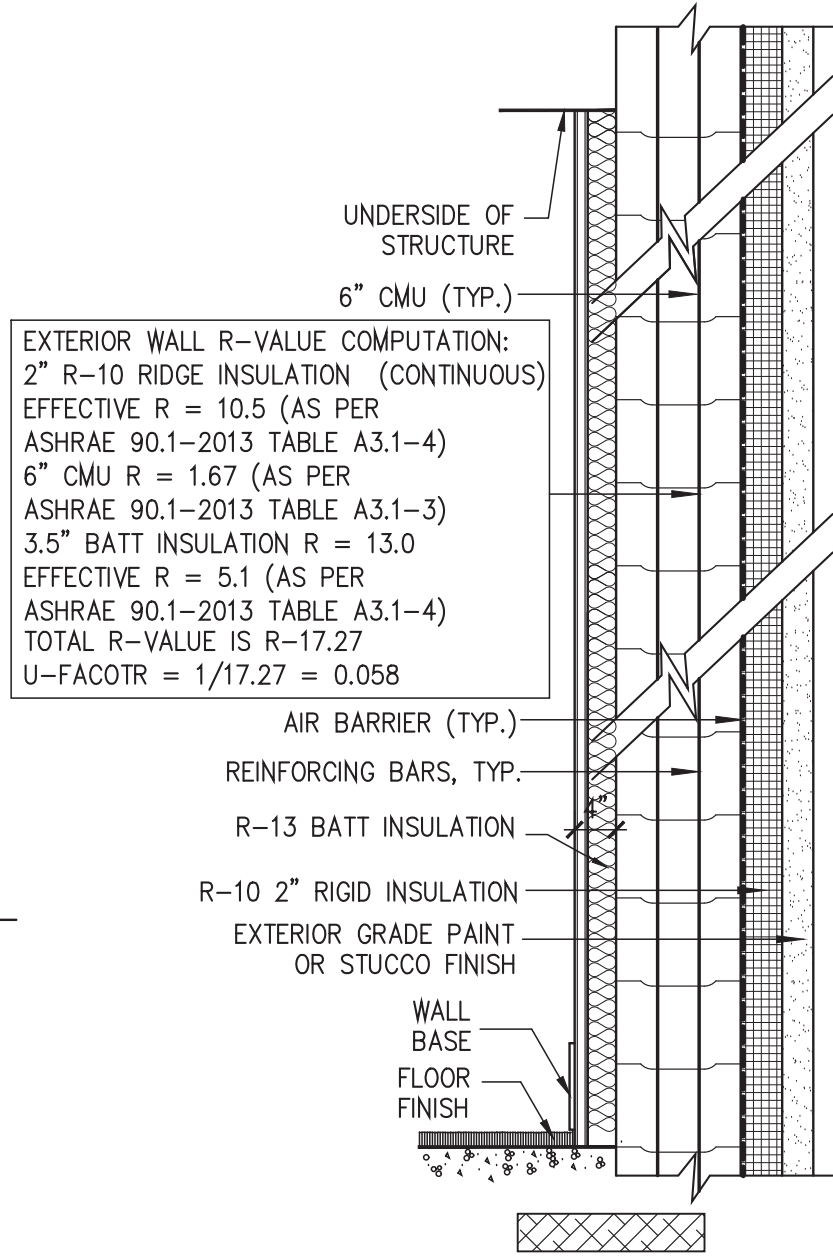
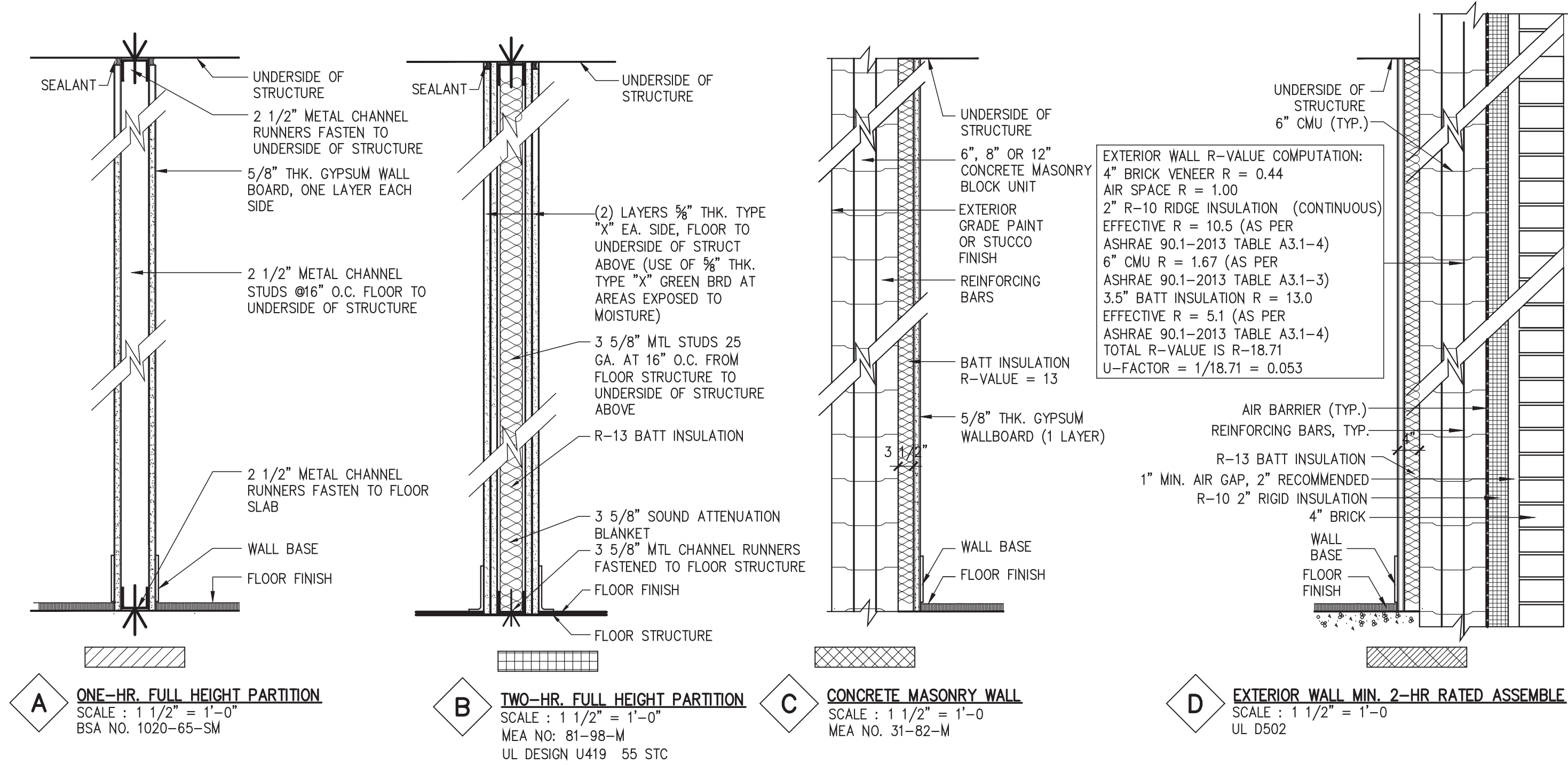
ROOF DETAIL AT HOT PIPE PENETRATION

SCALE: N.T.S.



EXHAUST FAN CURB DETAIL

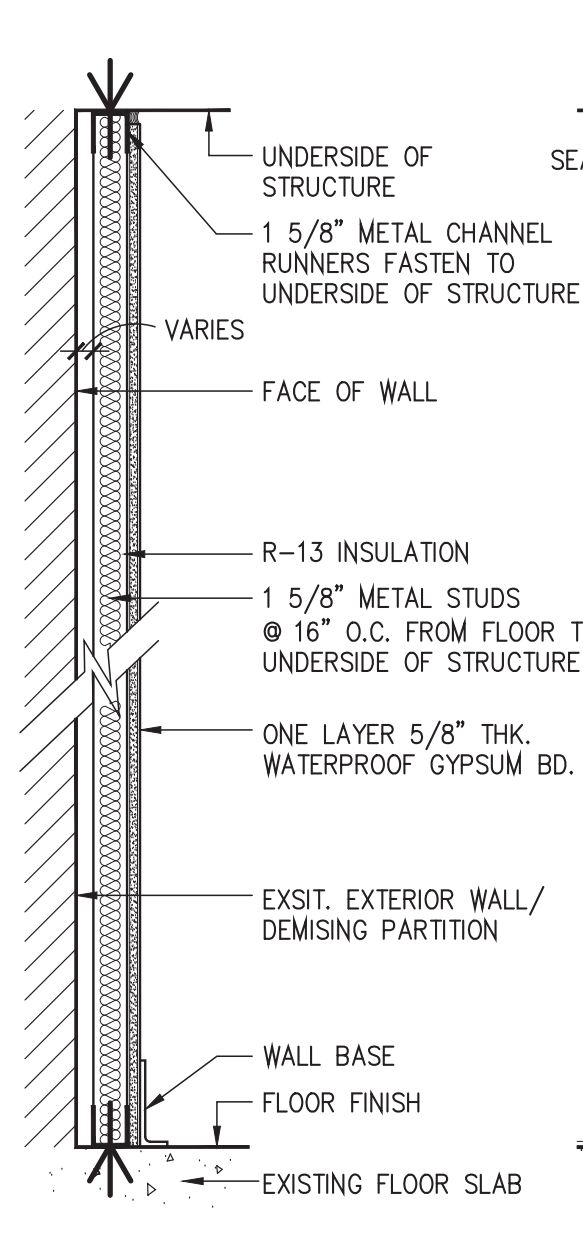
SCALE: N.T.S.



EXTERIOR WALL MIN. 2-HR RATED ASSEMBLY

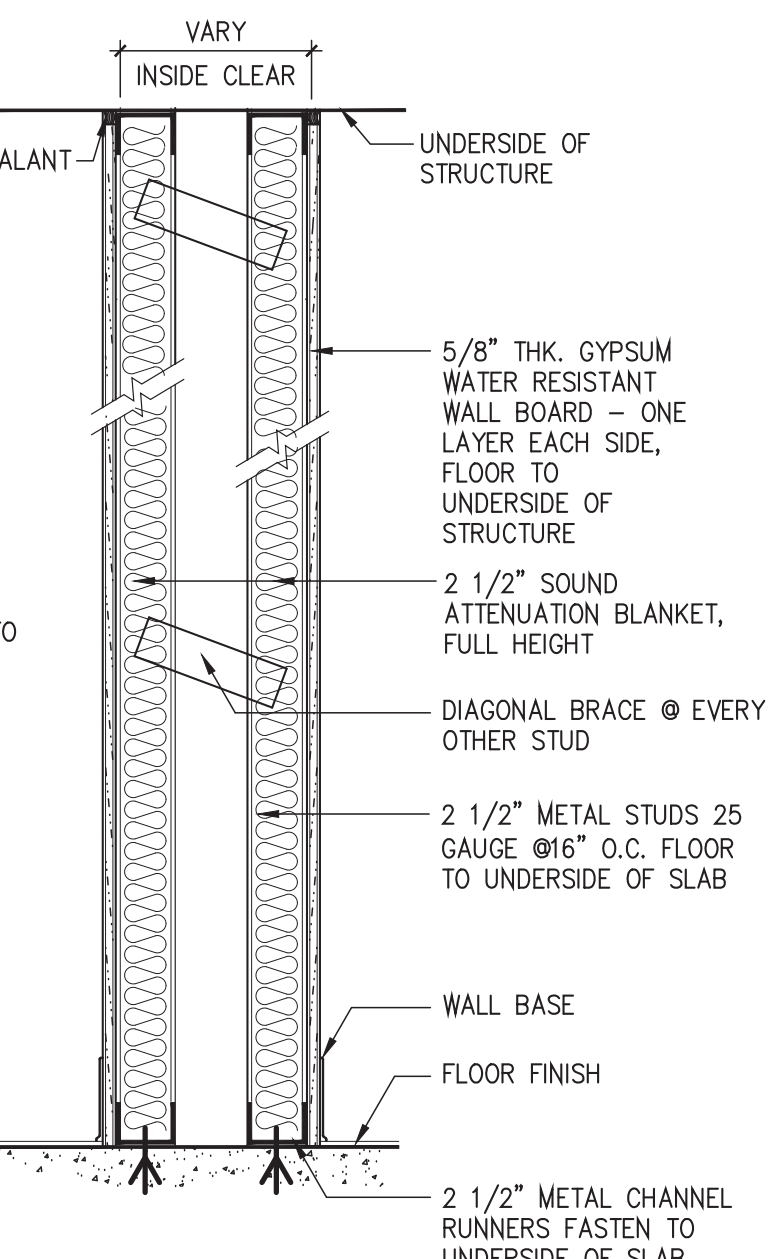
SCALE: 1 1/2" = 1'-0"
UL D502

NOTE: INSULATION MATERIAL SHALL COMPLY WITH BC 719.1.1.
INSULATION MATERIAL SHALL HAVE A FLAME SPREAD INDEX NOT GREATER THAN 25, A SMOKE-DEVELOPMENT INDEX NOT GREATER THAN 50, TESTED ACCORDANCE WITH ASTM E 84.



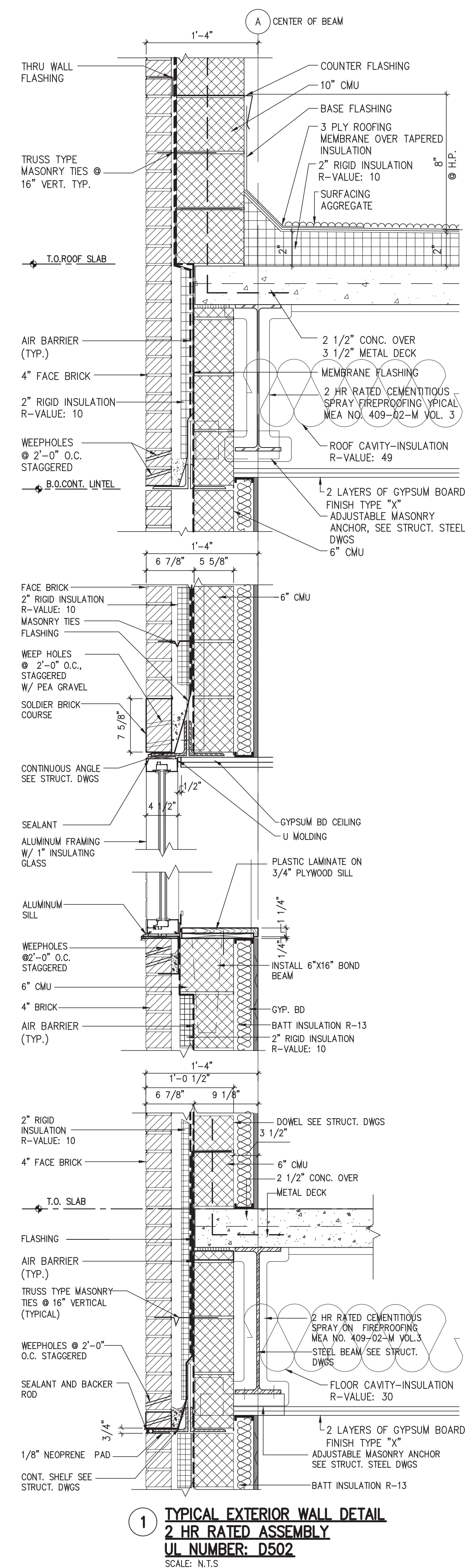
FURRED-OUT PARTITION

SCALE: 1 1/2" = 1'-0"



CHASE WALL DETAIL

SCALE: 1 1/2" = 1'-0"
MEA 203-93-M



ARCHITECT

**CITY BUILDING NY
ARCHITECT P.C.**
802 64th Street, #3
Brooklyn, NY 11220
Tel.: (718) 836-1828
Fax.: (718) 836-1707
8361828@gmail.com

STRUCTURAL ENGINEER

PROJECT

NEW BUILDING

1665 STILLWELL AVENUE
BROOKLYN NY 11223

DRAWING TITLE

TYPICAL DETAILS

REVISIONS

NO.	DATE	DESCRIPTION

NO.	DATE	ISSUED TO
-----	------	-----------

ISSUED

The reproduction of this drawing or the use of ideas and arrangements indicated on this drawing without the written approval of this office is prohibited. Written dimensions take precedence over scaled dimensions. The contractor shall verify dimensions and conditions at the job and report discrepancies to the Architect prior to the start of the work.

Proj. No. 18-1665
Date 12-12-18
Scale AS NOTED

Drawn
SEAL
REGISTERED ARCHITECT
TING HAO LI
DATE OF NEW YORK

DRAWING NUMBER

A-402.00

SHEET 17 OF 25

DOB STAMP

ORIENT AND affix BIS job number label here

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

DATE OF NEW YORK

STRUCTURAL ENGINEER

PROJECT

NEW BUILDING

1665 STILLWELL AVENUE
BROOKLYN NY 11223

DRAWING TITLE

PROPOSED DOOR AND WINDOW SCHEDULES

REVISIONS

NO.	DATE	ISSUED TO
-----	------	-----------

ISSUED

The reproduction of this drawing or the use of ideas and arrangements indicated on this drawing without the written approval of this office is prohibited. Written dimensions take precedence over scaled dimensions. The contractor shall verify dimensions and conditions at the job and report discrepancies to the Architect prior to the start of the work.

Proj. No. 18-1665

Date 12-12-18

Scale AS NOTED

Drawn

SF AI

DRAWING NUMBER

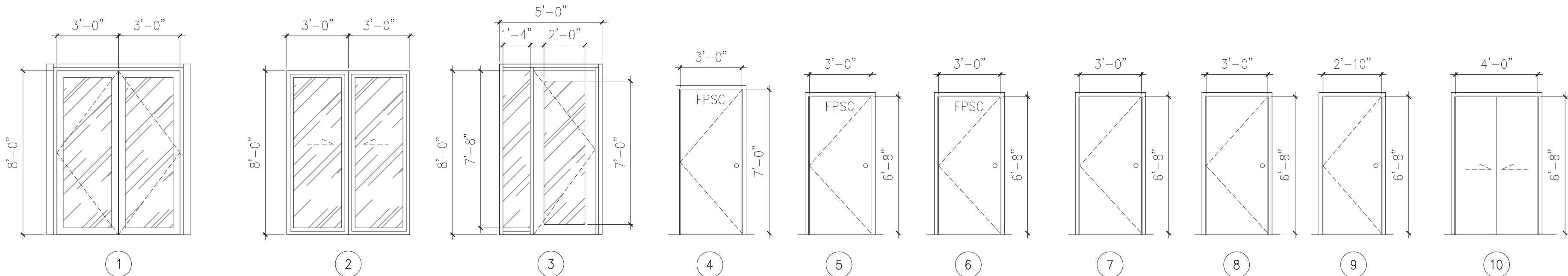
RECEIVED
STATE OF NEW YORK
932042

A-501.00

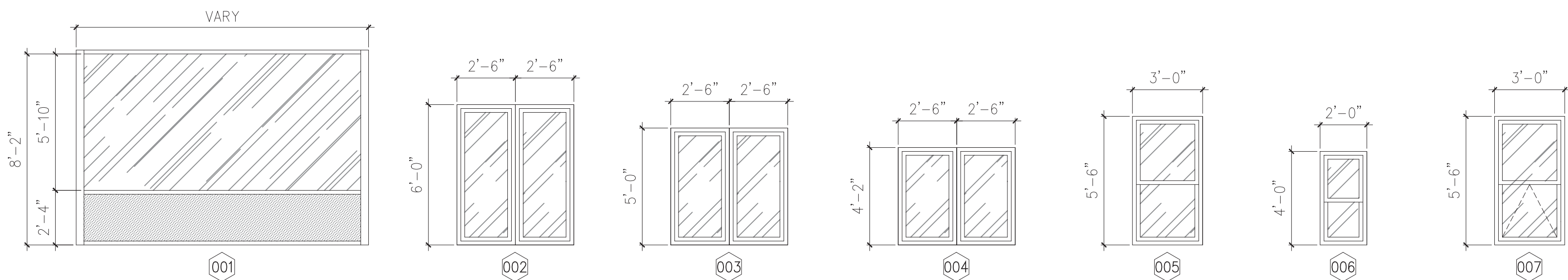
SHEET 18 OF 32

 Orient and affix BIS
lock number label here

DOR STAMP



NOTE: ALL EXTERIOR DOORS SHALL BE CERTIFIED BY NFRC AND HAVE PERFORMANCE RATINGS EQUAL OR BETTER THAN LISTED IN THIS DOOR SCHEDULE



NOTE: ALL WINDOWS SHALL BE CERTIFIED BY NFRC AND HAVE PERFORMANCE RATINGS EQUAL OR BETTER THAN LISTED IN THIS DOOR SCHEDULE

NOTE

1. AIR LEAKAGE: PROVIDE FLASHING, WINDOW DAMNS AND SEALANT, CAULKING AT WINDOW TO CREATE AIR BARRIER
2. AIR LEAKAGE: WEATHER STRIPPING AND INSULATION FOR ROOF HATCH DOOR
3. USE MANUFACTURE DOOR AS NOTED IN THE DRAWING FOR PROPER AIR LEAKAGE RATING.
4. SEE MANUFACTURING DETAIL FOR PROPER WINDOW AND DOOR INSTALLATION

5. THE BUILDING OR DWELLING UNIT SHALL BE TESTED AND VERIFIED AS HAVING AN AIR LEAKAGE RATE NOT EXCEEDING THREE AIR CHANGES PER HOUR. TESTING SHALL BE CONDUCTED IN ACCORDANCE WITH ASTM E 779 OR ASTM E 1827 AND REPORTED AT A PRESSURE OF 0.2 INCH W.G. (50 PASCALS). TESTING SHALL BE PERFORMED AT ANY TIME AFTER CREATION OF ALL PENETRATIONS OF THE BUILDING THERMAL ENVELOPE.

Appendix B

Historic Sanborn Maps



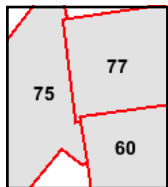
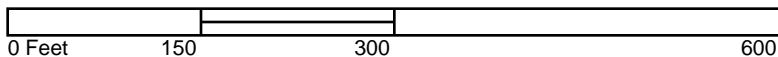
The certified Sanborn Library search results in this report can be authenticated by visiting www.edr.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

Certification # 1E8D-4FF7-8AD9

Site Name: 1665 - 1673 Stillwell Avenue
 Address: 1665 - 1673 Stillwell Avenue
 City, ST, ZIP: Brooklyn, NY 11223
 Client: American Env. Assessment & Sol.
 EDR Inquiry: 5632258.3
 Order Date: 04/25/2019
 Certification # 1E8D-4FF7-8AD9
 Copyright 2007



This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.



Volume 14, Sheet 60
 Volume 13, Sheet 77
 Volume 12, Sheet 75





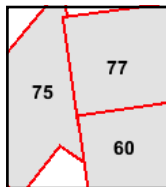
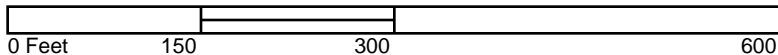
The certified Sanborn Library search results in this report can be authenticated by visiting www.edr.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

Certification # 1E8D-4FF7-8AD9

Site Name: 1665 - 1673 Stillwell Avenue
 Address: 1665 - 1673 Stillwell Avenue
 City, ST, ZIP: Brooklyn, NY 11223
 Client: American Env. Assessment & Sol.
 EDR Inquiry: 5632258.3
 Order Date: 04/25/2019
 Certification # 1E8D-4FF7-8AD9
 Copyright 2006



This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.



Volume 12, Sheet 75
 Volume 13, Sheet 77
 Volume 14, Sheet 60





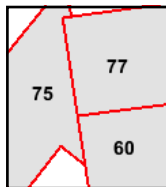
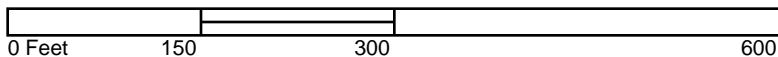
The certified Sanborn Library search results in this report can be authenticated by visiting www.edr.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

Certification # 1E8D-4FF7-8AD9

Site Name: 1665 - 1673 Stillwell Avenue
 Address: 1665 - 1673 Stillwell Avenue
 City, ST, ZIP: Brooklyn, NY 11223
 Client: American Env. Assessment & Sol.
 EDR Inquiry: 5632258.3
 Order Date: 04/25/2019
 Certification # 1E8D-4FF7-8AD9
 Copyright 2005



This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.



Volume 14, Sheet 60
 Volume 13, Sheet 77
 Volume 12, Sheet 75





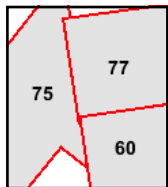
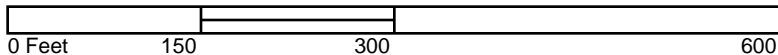
The certified Sanborn Library search results in this report can be authenticated by visiting www.edr.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

Certification # 1E8D-4FF7-8AD9

Site Name: 1665 - 1673 Stillwell Avenue
 Address: 1665 - 1673 Stillwell Avenue
 City, ST, ZIP: Brooklyn, NY 11223
 Client: American Env. Assessment & Sol.
 EDR Inquiry: 5632258.3
 Order Date: 04/25/2019
 Certification # 1E8D-4FF7-8AD9
 Copyright 2004



This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.



Volume 13, Sheet 77
 Volume 12, Sheet 75
 Volume 14, Sheet 60





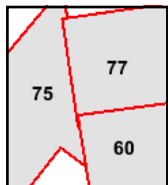
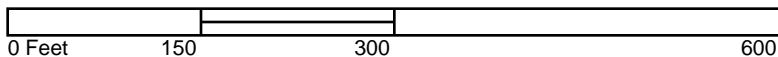
The certified Sanborn Library search results in this report can be authenticated by visiting www.edr.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

Certification # 1E8D-4FF7-8AD9

Site Name: 1665 - 1673 Stillwell Avenue
 Address: 1665 - 1673 Stillwell Avenue
 City, ST, ZIP: Brooklyn, NY 11223
 Client: American Env. Assessment & Sol.
 EDR Inquiry: 5632258.3
 Order Date: 04/25/2019
 Certification # 1E8D-4FF7-8AD9
 Copyright 2003

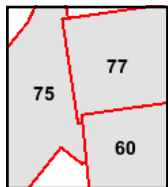
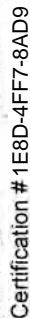


This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.



Volume 14, Sheet 60
 Volume 12, Sheet 75
 Volume 13, Sheet 77





5632258 - 3 page 16



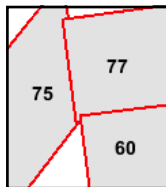
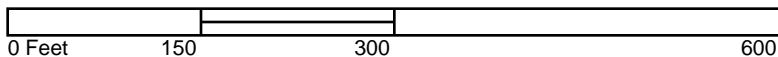
The certified Sanborn Library search results in this report can be authenticated by visiting www.edr.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

Certification # 1E8D-4FF7-8AD9

Site Name: 1665 - 1673 Stillwell Avenue
 Address: 1665 - 1673 Stillwell Avenue
 City, ST, ZIP: Brooklyn, NY 11223
 Client: American Env. Assessment & Sol.
 EDR Inquiry: 5632258.3
 Order Date: 04/25/2019
 Certification # 1E8D-4FF7-8AD9
 Copyright 2001



This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.



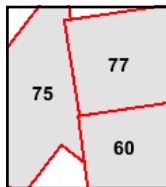
Volume 14, Sheet 60
 Volume 12, Sheet 75
 Volume 13, Sheet 77



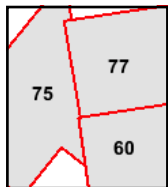
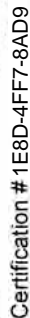


The certified Sanborn Library search results in this report can be authenticated by visiting www.edr.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

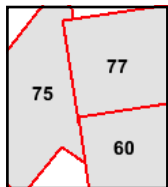
Certification # 1E8D-4FF7-8AD9



Volume 14, Sheet 60
 Volume 13, Sheet 77
 Volume 12, Sheet 75



5632258 - 3 page 19



Volume 14, Sheet 60
 Volume 13, Sheet 77
 Volume 12, Sheet 75



The certified Sanborn Library search results in this report can be authenticated by visiting www.edr.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

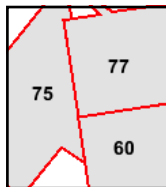
Certification # 1E8D-4FF7-8AD9

Site Name: 1665 - 1673 Stillwell Avenue
 Address: 1665 - 1673 Stillwell Avenue
 City, ST, ZIP: Brooklyn, NY 11223
 Client: American Env. Assessment & Sol.
 EDR Inquiry: 5632258.3
 Order Date: 04/25/2019
 Certification # 1E8D-4FF7-8AD9
 Copyright 1993



This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.

0 Feet 150 300 600



Volume 13, Sheet 77
 Volume 12, Sheet 75
 Volume 14, Sheet 60





The certified Sanborn Library search results in this report can be authenticated by visiting www.edr.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

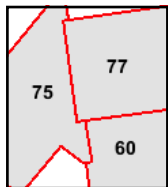
Certification # 1E8D-4FF7-8AD9

Site Name: 1665 - 1673 Stillwell Avenue
Address: 1665 - 1673 Stillwell Avenue
City, ST, ZIP: Brooklyn, NY 11223
Client: American Env. Assessment & Sol.
EDR Inquiry: 5632258.3
Order Date: 04/25/2019
Certification # 1E8D-4FF7-8AD9
Copyright 1992



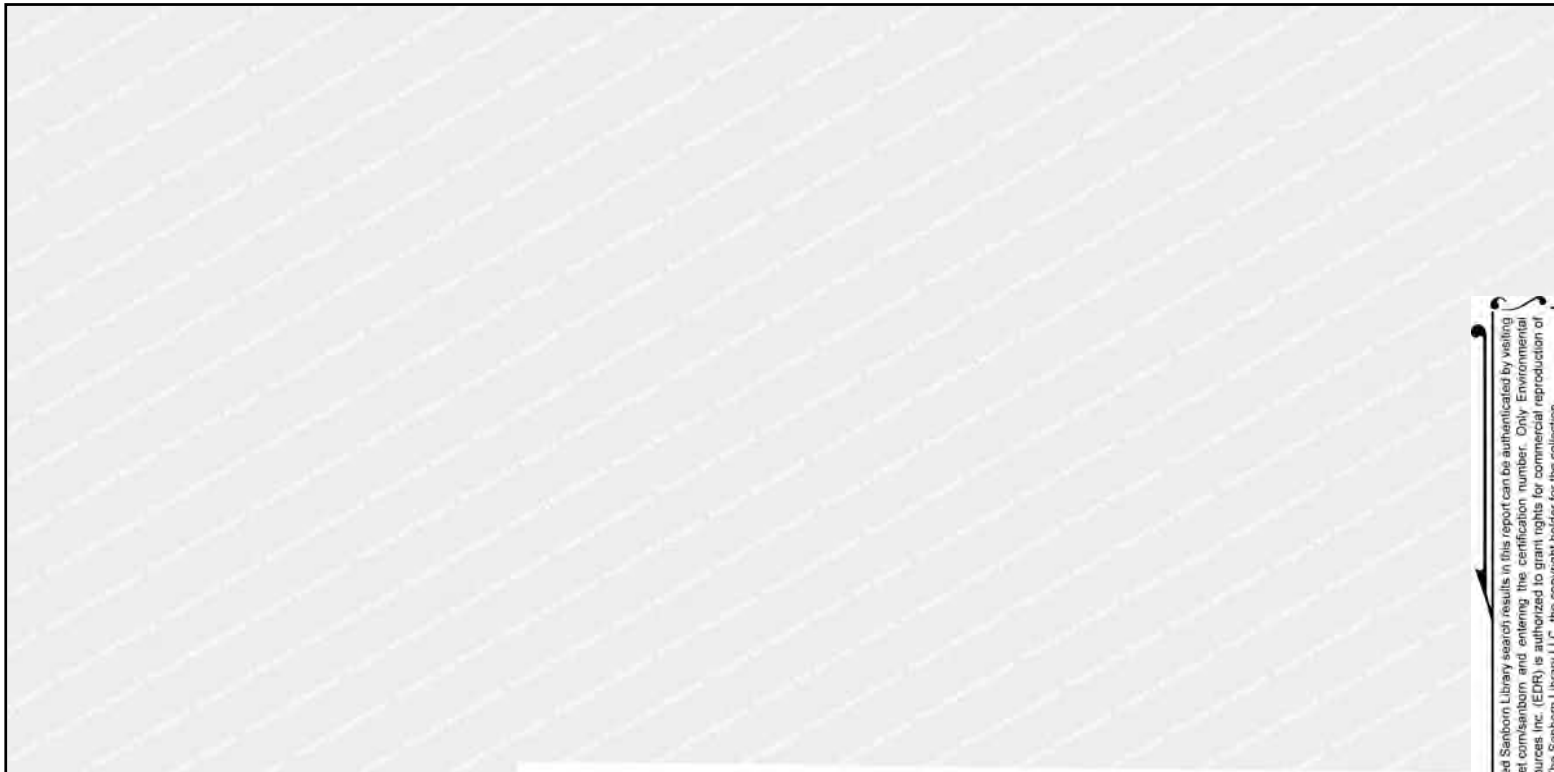
This Certified Sanborn Map combines the following sheets.
Outlined areas indicate map sheets within the collection.

0 Feet 150 300 600



Volume 12, Sheet 75
Volume 14, Sheet 60
Volume 13, Sheet 77





The certified Sanborn Library search results in this report can be authenticated by visiting www.edrnet.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

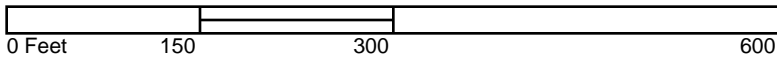


Certification # 1E8D-4FF7-8AD9

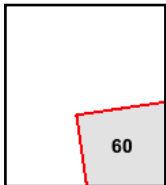
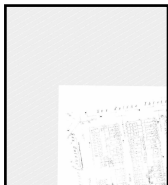
Site Name: 1665 - 1673 Stillwell Avenue
 Address: 1665 - 1673 Stillwell Avenue
 City, ST, ZIP: Brooklyn, NY 11223
 Client: American Env. Assessment & Sol.
 EDR Inquiry: 5632258.3
 Order Date: 04/25/2019
 Certification # 1E8D-4FF7-8AD9
 Copyright 1991



This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.



Volume 14, Sheet 60





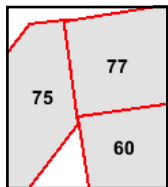
The certified Sanborn Library search results in this report can be authenticated by visiting www.edr.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

Certification # 1E8D-4FF7-8AD9

Site Name: 1665 - 1673 Stillwell Avenue
 Address: 1665 - 1673 Stillwell Avenue
 City, ST, ZIP: Brooklyn, NY 11223
 Client: American Env. Assessment & Sol.
 EDR Inquiry: 5632258.3
 Order Date: 04/25/2019
 Certification # 1E8D-4FF7-8AD9
 Copyright 1990



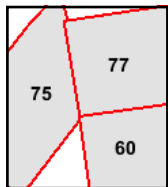
This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.



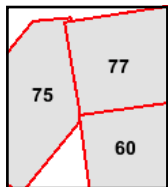
Volume 13, Sheet 77
 Volume 12, Sheet 75
 Volume 14, Sheet 60

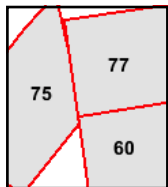
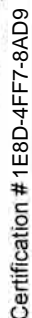
0 Feet 150 300 600





Volume 14, Sheet 60
Volume 12, Sheet 75
Volume 13, Sheet 77





5632258 - 3 page 27



The certified Sanborn Library search results in this report can be authenticated by visiting www.edr.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

Certification # 1E8D-4FF7-8AD9



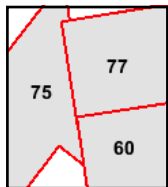
The certified Sanborn Library search results in this report can be authenticated by visiting www.edr.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

Certification # 1E8D-4FF7-8AD9

Site Name: 1665 - 1673 Stillwell Avenue
Address: 1665 - 1673 Stillwell Avenue
City, ST, ZIP: Brooklyn, NY 11223
Client: American Env. Assessment & Sol.
EDR Inquiry: 5632258.3
Order Date: 04/25/2019
Certification # 1E8D-4FF7-8AD9
Copyright 1981



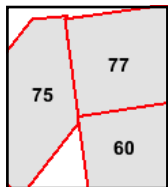
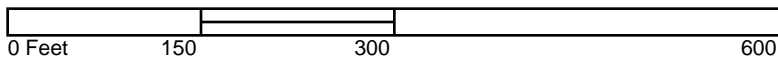
This Certified Sanborn Map combines the following sheets.
Outlined areas indicate map sheets within the collection.



Volume 14, Sheet 60
Volume 12, Sheet 75
Volume 13, Sheet 77



This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.



Volume 12, Sheet 75
 Volume 13, Sheet 77
 Volume 14, Sheet 60





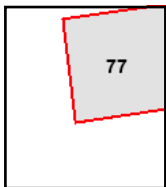
The certified Sanborn Library search results in this report can be authenticated by visiting www.edrnet.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

Certification # 1E8D-4FF7-8AD9

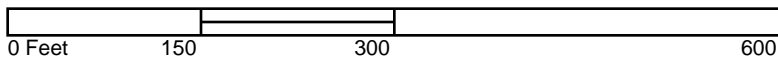
Site Name: 1665 - 1673 Stillwell Avenue
 Address: 1665 - 1673 Stillwell Avenue
 City, ST, ZIP: Brooklyn, NY 11223
 Client: American Env. Assessment & Sol.
 EDR Inquiry: 5632258.3
 Order Date: 04/25/2019
 Certification # 1E8D-4FF7-8AD9
 Copyright 1979



This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.



Volume 13, Sheet 77





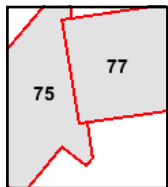
The certified Sanborn Library search results in this report can be authenticated by visiting www.edr.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

Certification # 1E8D-4FF7-8AD9

Site Name: 1665 - 1673 Stillwell Avenue
Address: 1665 - 1673 Stillwell Avenue
City, ST, ZIP: Brooklyn, NY 11223
Client: American Env. Assessment & Sol.
EDR Inquiry: 5632258.3
Order Date: 04/25/2019
Certification # 1E8D-4FF7-8AD9
Copyright 1977



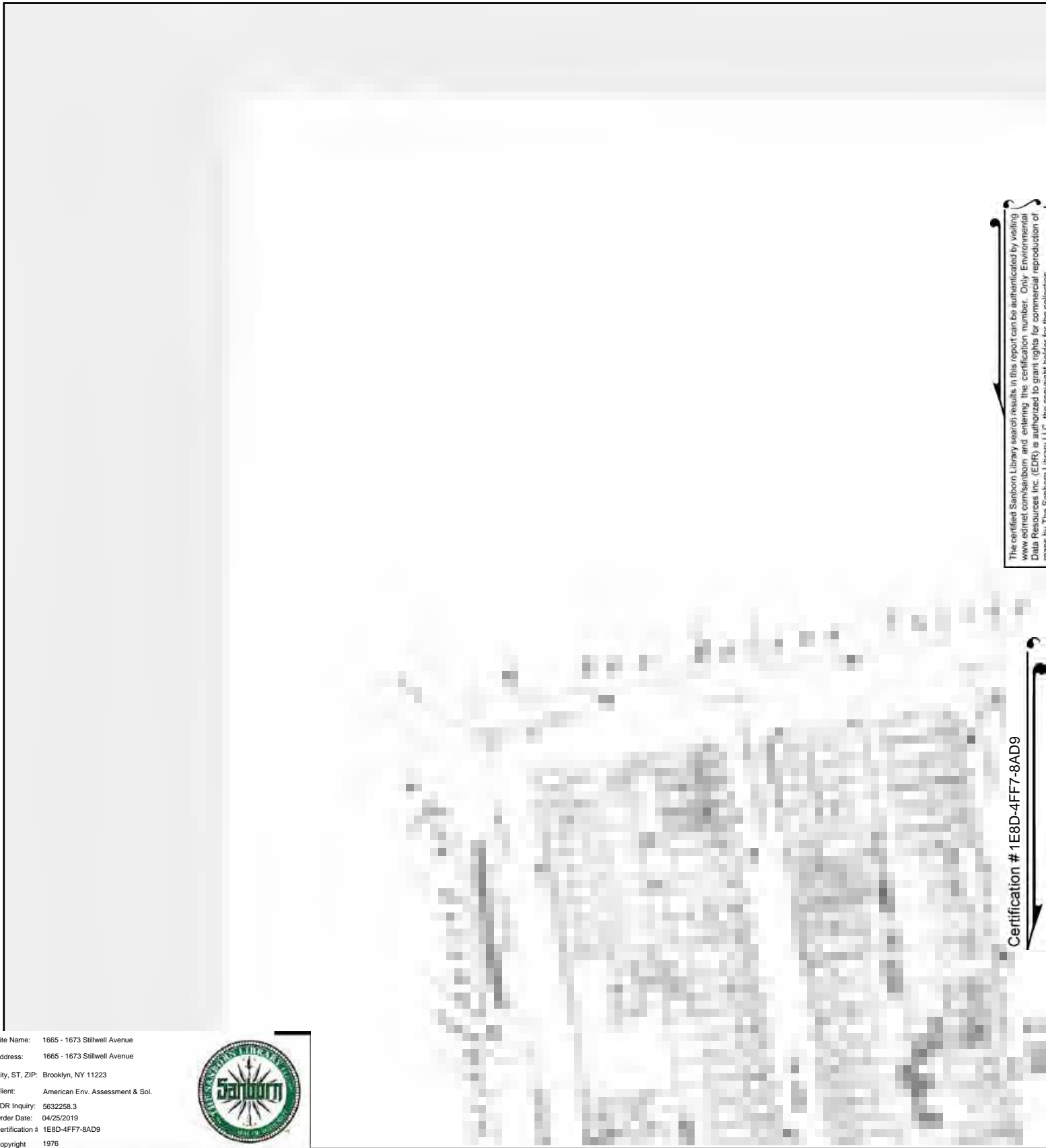
This Certified Sanborn Map combines the following sheets.
Outlined areas indicate map sheets within the collection.



Volume 13, Sheet 77
Volume 12, Sheet 75

0 Feet 150 300 600





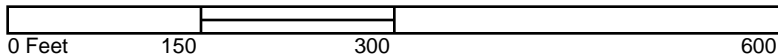
The certified Sanborn Library search results in this report can be authenticated by visiting www.edrnet.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

Certification # 1E8D-4FF7-8AD9

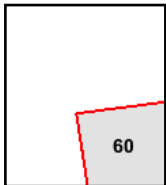
Site Name: 1665 - 1673 Stillwell Avenue
 Address: 1665 - 1673 Stillwell Avenue
 City, ST, ZIP: Brooklyn, NY 11223
 Client: American Env. Assessment & Sol.
 EDR Inquiry: 5632258.3
 Order Date: 04/25/2019
 Certification # 1E8D-4FF7-8AD9
 Copyright 1976



This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.

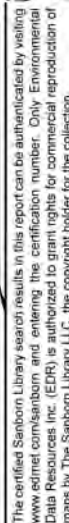


Volume 14, Sheet 60

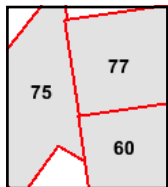


60





Certification # 1E8D-4FF7-8AD9



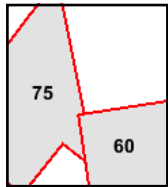
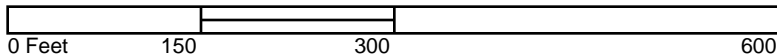
Volume 14, Sheet 60
Volume 13, Sheet 77
Volume 12, Sheet 75



The certified Sanborn Library search results in this report can be authenticated by visiting www.edr.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

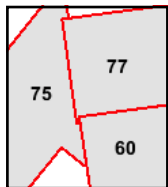
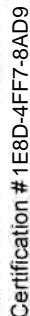
Certification # 1E8D-4FF7-8AD9

This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.



Volume 12, Sheet 75
 Volume 14, Sheet 60





5632258 - 3 page 36



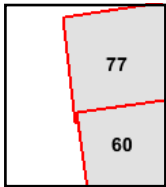
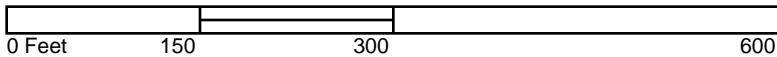
The certified Sanborn Library search results in this report can be authenticated by visiting www.edrnet.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

Certification # 1E8D-4FF7-8AD9

Site Name: 1665 - 1673 Stillwell Avenue
 Address: 1665 - 1673 Stillwell Avenue
 City, ST, ZIP: Brooklyn, NY 11223
 Client: American Env. Assessment & Sol.
 EDR Inquiry: 5632258.3
 Order Date: 04/25/2019
 Certification # 1E8D-4FF7-8AD9
 Copyright 1930

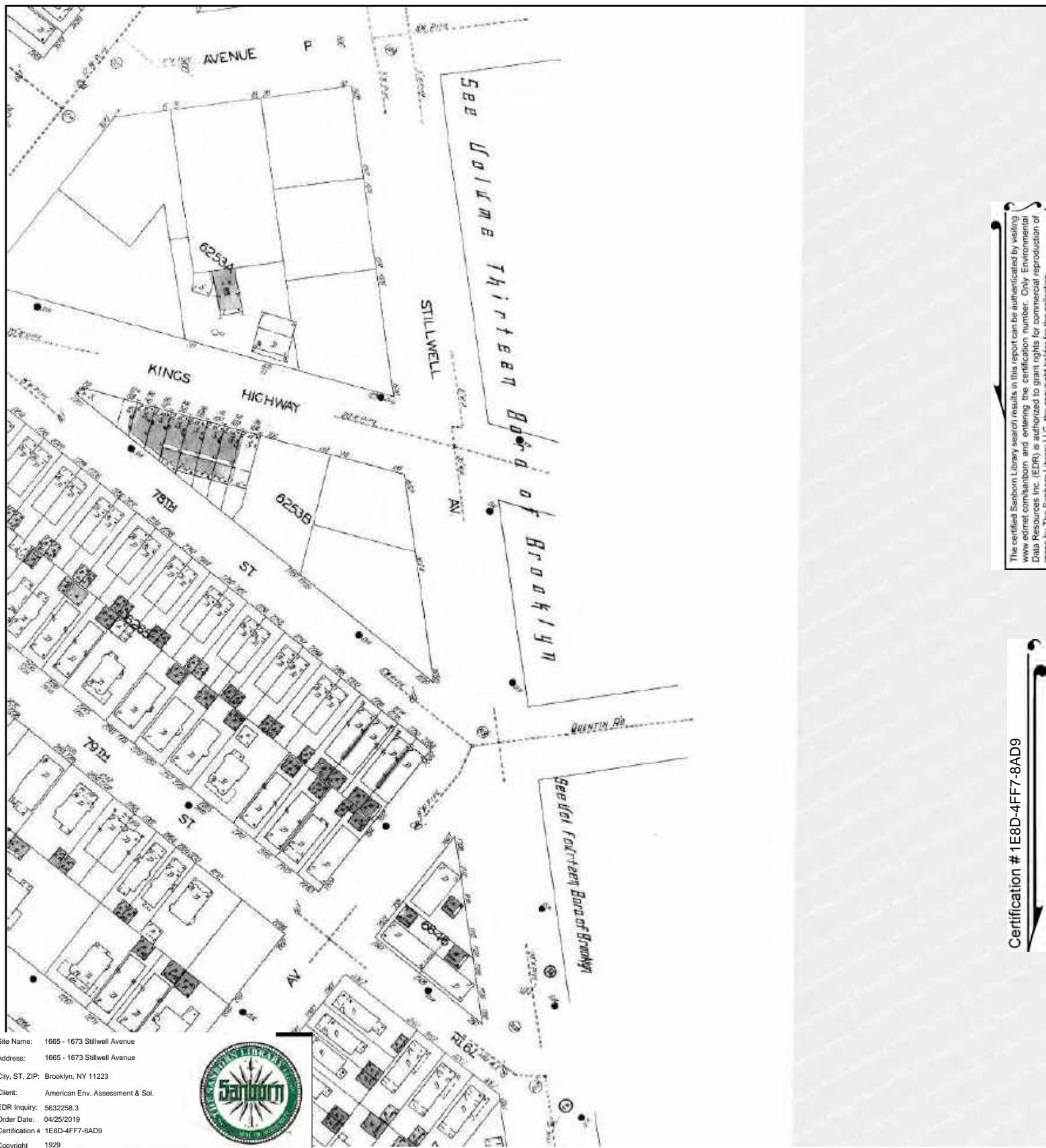


This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.

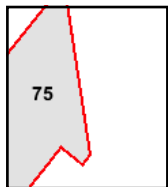
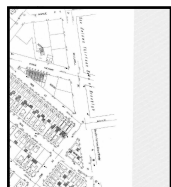


Volume 14, Sheet 60
 Volume 13, Sheet 77

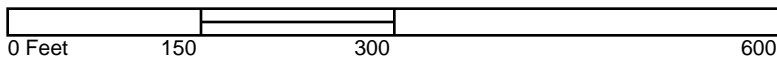


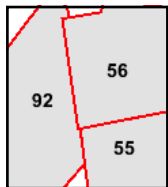


This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.

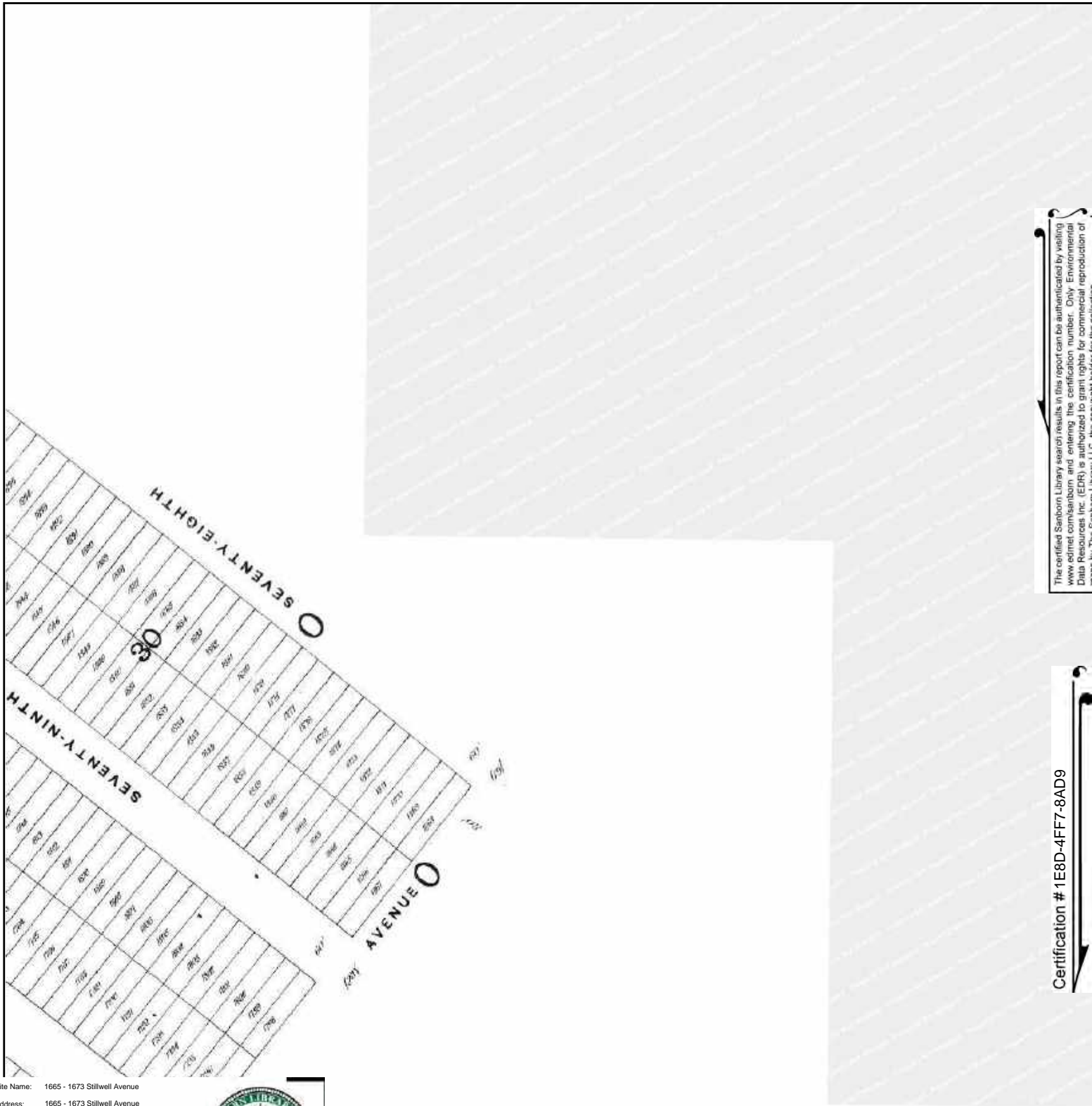


Volume 12, Sheet 75





Volume 12, Sheet 92
Volume 13, Sheet 56
Volume 13, Sheet 55



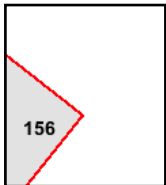
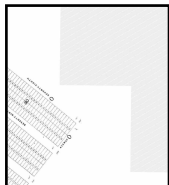
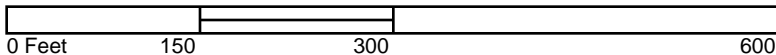
The certified Sanborn Library search results in this report can be authenticated by visiting www.edr.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by The Sanborn Library LLC, the copyright holder for the collection.

Certification # 1E8D-4FF7-8AD9

Site Name: 1665 - 1673 Stillwell Avenue
 Address: 1665 - 1673 Stillwell Avenue
 City, ST, ZIP: Brooklyn, NY 11223
 Client: American Env. Assessment & Sol.
 EDR Inquiry: 5632258.3
 Order Date: 04/25/2019
 Certification # 1E8D-4FF7-8AD9
 Copyright 1895



This Certified Sanborn Map combines the following sheets.
 Outlined areas indicate map sheets within the collection.



Volume B, Sheet 156



Appendix C

Community Participation Plan

Brownfield Cleanup Program

Citizen Participation Plan

for

**1665-1673 Stillwell Avenue
Brooklyn, NY 11223**

February 2024

NYCDEC Site No.: C224307
1665-1673 Stillwell Avenue
Brooklyn
Kings County, New York

Contents

<u>Section</u>	<u>Page Number</u>
1. What is New York's Brownfield Cleanup Program?	3
2. Citizen Participation Activities	3
3. Major Issues of Public Concern	9
4. Site Information.....	10
5. Investigation and Cleanup Process	10
Appendix A - Project Contacts and Locations of Reports and Information	13
Appendix B - Site Contact List	14
Appendix C - Site Location Map	16
Appendix D - Brownfield Cleanup Program Process	18

* * * * *

Note: The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation. Portions of this Citizen Participation Plan may be revised during the site's investigation and cleanup process.

Applicant: **Sai Truong D.b.a. Refulgence LLC**
Site Name: **1665-1673 Stillwell Avenue, Brooklyn, NY 11223**
Site Address: **1665-1673 Stillwell Avenue**
Site County: **Kings County**
Site Number: **C224307**

1. What is New York's Brownfield Cleanup Program?

New York's Brownfield Cleanup Program (BCP) works with private developers to encourage the voluntary cleanup of contaminated properties known as "brownfields" so that they can be reused and developed. These uses include recreation, housing, and business.

A *brownfield* is any real property that is difficult to reuse or redevelop because of the presence or potential presence of contamination. A brownfield typically is a former industrial or commercial property where operations may have resulted in environmental contamination. A brownfield can pose environmental, legal, and financial burdens on a community. If a brownfield is not addressed, it can reduce property values in the area and affect economic development of nearby properties.

The BCP is administered by the New York State Department of Environmental Conservation (NYSDEC) which oversees Applicants who conduct brownfield site investigation and cleanup activities. An Applicant is a person who has requested to participate in the BCP and has been accepted by NYSDEC. The BCP contains investigation and cleanup requirements, ensuring that cleanups protect public health and the environment. When NYSDEC certifies that these requirements have been met, the property can be reused or redeveloped for the intended use.

For more information about the BCP, go online at:
<http://www.dec.ny.gov/chemical/8450.html> .

2. Citizen Participation Activities

Why NYSDEC Involves the Public and Why It Is Important

NYSDEC involves the public to improve the process of investigating and cleaning up contaminated sites, and to enable citizens to participate more fully in decisions that affect their health, environment, and social well-being. NYSDEC provides opportunities for citizen involvement and encourages early two-way communication with citizens before decision makers form or adopt final positions.

Involving citizens affected and interested in site investigation and cleanup programs is important for many reasons. These include:

- Promoting the development of timely, effective site investigation and cleanup programs that protect public health and the environment.
- Improving public access to, and understanding of, issues and information related to a particular site and that site's investigation and cleanup process.
- Providing citizens with early and continuing opportunities to participate in NYSDEC's site investigation and cleanup process.
- Ensuring that NYSDEC makes site investigation and cleanup decisions that benefit from input that reflects the interests and perspectives found within the affected community.
- Encouraging dialogue to promote the exchange of information among the affected/interested public, State agencies, and other interested parties that strengthens trust among the parties, increases understanding of site and community issues and concerns, and improves decision making.

This Citizen Participation (CP) Plan provides information about how NYSDEC will inform and involve the public during the investigation and cleanup of the site identified above. The public information and involvement program will be carried out with assistance, as appropriate, from the Applicant.

Project Contacts

Appendix A identifies NYSDEC project contact(s) to whom the public should address questions or request information about the site's investigation and cleanup program. The public's suggestions about this CP Plan and the CP program for the site are always welcome. Interested people are encouraged to share their ideas and suggestions with the project contacts at any time.

Locations of Reports and Information

The locations of the reports and information related to the site's investigation and cleanup program also are identified in **Appendix A**. These locations provide convenient access to important project documents for public review and comment. Some documents may be placed on the NYSDEC web site. If this occurs, NYSDEC will inform the public in fact sheets distributed about the site and by other means, as appropriate.

Site Contact List

Appendix B contains the site contact list. This list has been developed to keep the community informed about, and involved in, the site's investigation and cleanup process. The site contact list will be used periodically to distribute fact

sheets that provide updates about the status of the project. These will include notifications of upcoming activities at the site (such as fieldwork), as well as availability of project documents and announcements about public comment periods.

The site contact list includes, at a minimum:

- chief executive officer and planning board chairperson of each county, city, town and village in which the site is located.
- residents, owners, and occupants of the site and properties adjacent to the site.
- the public water supplier which services the area in which the site is located.
- any person who has requested to be placed on the site contact list.
- the administrator of any school or day care facility located on or near the site for purposes of posting and/or dissemination of information at the facility.
- location(s) of reports and information.

The site contact list will be reviewed periodically and updated as appropriate. Individuals and organizations will be added to the site contact list upon request. Such requests should be submitted to the NYSDEC project contact(s) identified in **Appendix A**. Other additions to the site contact list may be made at the discretion of the NYSDEC project manager, in consultation with other NYSDEC staff as appropriate.

Note: The first site fact sheet (usually related to the draft Remedial Investigation Work Plan) is distributed both by paper mailing through the postal service and through DEC Delivers, its email listserv service. The fact sheet includes instructions for signing up with the appropriate county listserv to receive future notifications about the site. See <http://www.dec.ny.gov/chemical/61092.html>.

Subsequent fact sheets about the site will be distributed exclusively through the listserv, except for households without internet access that have indicated the need to continue to receive site information in paper form. Please advise the NYSDEC site project manager identified in **Appendix A** if that is the case. Paper mailings may continue during the investigation and cleanup process for some sites, based on public interest and need.

CP Activities

The table at the end of this section identifies the CP activities, at a minimum, that have been and will be conducted during the site's investigation and cleanup program. The flowchart in **Appendix D** shows how these CP activities integrate with the site investigation and cleanup process. The public is informed about these CP activities

through fact sheets and notices distributed at significant points during the program. Elements of the investigation and cleanup process that match up with the CP activities are explained briefly in Section 5.

- **Notices and fact sheets** help the interested and affected public to understand contamination issues related to a site, and the nature and progress of efforts to investigate and clean up a site.
- **Public forums, comment periods and contact with project managers** provide opportunities for the public to contribute information, opinions and perspectives that have potential to influence decisions about a site's investigation and cleanup.
- **Document repository** allows the public to access and review project documents including investigation and cleanup work plans and final reports.

The public is encouraged to contact project staff at any time during the site's investigation and cleanup process with questions, comments, or requests for information.

This CP Plan may be revised due to changes in major issues of public concern identified in Section 3 or in the nature and scope of investigation and cleanup activities. Modifications may include additions to the site contact list and changes in planned citizen participation activities.

Technical Assistance Grant

NYSDEC must determine if the site poses a significant threat to public health or the environment. This determination generally is made using information developed during the investigation of the site, as described in Section 5.

If the site is determined to be a significant threat, a qualifying community group may apply for a Technical Assistance Grant (TAG). The purpose of a TAG is to provide funds to the qualifying group to obtain independent technical assistance. This assistance helps the TAG recipient to interpret and understand existing environmental information about the nature and extent of contamination related to the site and the development/implementation of a remedy.

An eligible community group must certify that its membership represents the interests of the community affected by the site, and that its members' health, economic well-being or enjoyment of the environment may be affected by a release or threatened release of contamination at the site.

As of the date the declaration (page 2) was signed by the NYSDEC project manager, it has been determined that the site does not pose a significant threat.

To verify the significant threat status of the site, the interested public may contact the NYSDEC project manager identified in **Appendix A**.

For more information about TAGs, go online at
<http://www.dec.ny.gov/regulations/2590.html>

Note: The table identifying the citizen participation activities related to the site's investigation and cleanup program follows on the next page:

Citizen Participation Activities	Timing of CP Activity(ies)
Application Process:	
<ul style="list-style-type: none"> • Prepare site contact list • Establish document repository(ies) 	At time of preparation of application to participate in the BCP.
<ul style="list-style-type: none"> • Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of application and 30-day public comment period • Publish above ENB content in local newspaper • Mail above ENB content to site contact list • Conduct 30-day public comment period 	When NYSDEC determines that BCP application is complete. The 30-day public comment period begins on date of publication of notice in ENB. End date of public comment period is as stated in ENB notice. Therefore, ENB notice, newspaper notice, and notice to the site contact list should be provided to the public at the same time.
After Execution of Brownfield Site Cleanup Agreement (BCA):	
<ul style="list-style-type: none"> • Prepare Citizen Participation (CP) Plan 	Before start of Remedial Investigation Note: Applicant must submit CP Plan to NYSDEC for review and approval within 20 days of the effective date of the BCA.
Before NYSDEC Approves Remedial Investigation (RI) Work Plan:	
<ul style="list-style-type: none"> • Distribute fact sheet to site contact list about proposed RI activities and announcing 30-day public comment period about draft RI Work Plan • Conduct 30-day public comment period 	Before NYSDEC approves RI Work Plan. If RI Work Plan is submitted with application, public comment periods will be combined and public notice will include fact sheet. Thirty-day public comment period begins/ends as per dates identified in fact sheet.
After Applicant Completes Remedial Investigation:	
<ul style="list-style-type: none"> • Distribute fact sheet to site contact list that describes RI results 	Before NYSDEC approves RI Report
Before NYSDEC Approves Remedial Work Plan (RWP):	
<ul style="list-style-type: none"> • Distribute fact sheet to site contact list about draft RWP and announcing 45-day public comment period • Public meeting by NYSDEC about proposed RWP (if requested by affected community or at discretion of NYSDEC project manager) • Conduct 45-day public comment period 	Before NYSDEC approves RWP. 45-day public comment period begins/ends as per dates identified in fact sheet. Public meeting would be held within the 45-day public comment period.
Before Applicant Starts Cleanup Action:	
<ul style="list-style-type: none"> • Distribute fact sheet to site contact list that describes upcoming cleanup action 	Before the start of cleanup action.
After Applicant Completes Cleanup Action:	
<ul style="list-style-type: none"> • Distribute fact sheet to site contact list that announces that cleanup action has been completed and that NYSDEC is reviewing the Final Engineering Report • Distribute fact sheet to site contact list announcing NYSDEC approval of Final Engineering Report and issuance of Certificate of Completion (COC) 	At the time the cleanup action has been completed. Note: The two fact sheets are combined when possible if there is not a delay in issuing the COC.

3. Major Issues of Public Concern

This section of the CP Plan identifies major issues of public concern that relate to the Site. Additional major issues of public concern may be identified during the course of the Site's investigation and cleanup process.

The Site, located in Brooklyn Community Board #11, falls in one of the Environmental Justice (EJ) areas in New York City with pre-dominant population of Asian and Hispanic. So, the "Scoping Sheet for Major Issues of Public Concern" was referred to identify major issues of public concerns at and around the Site and further decide the course of action to address these concerns. The redevelopment plan for the Site includes construction of a new five (5) story mixed-use residential and commercial building. The major issues of concern to the public relate to potential impacts of nuisance odors and dust during the disturbance of historic fill soils at the Site. This includes concerns regarding excavation/handling and off-site disposal of the contaminated soil and more significantly, the potential generation of vapor/dust while the remedial action is taking place. In order to reduce these impacts, the remedial work will be performed in accordance with procedures which will be specified under a detailed Remedial Program which considers and takes preventive measures for exposures to future residents of the Site and those on adjacent properties during construction. Onsite receptors are limited to contractors, trespassers, site representatives and visitors granted access to the Site. During construction, potential on-site receptors include construction workers, site representatives, and visitors. Under proposed future conditions, potential on-site receptors include adult and child building residents, workers, and visitors. Potential off-site receptors within a 500-foot radius of the Site include the people working at and visiting the public library, school and the daycare facilities.

During construction, on-Site and off-Site exposures to contaminated dust from on-Site will be addressed through the Soil/Materials Management Plan (SMMP), dust controls, and through the implementation of the Community Air-Monitoring Program (CAMP) and a Construction Health and Safety Plan (CHASP). These plans prepared as a part of the Remedial Action Work Plan (RAWP) and will be available for public review at the document repository. Implementation of these plans will be under the direct oversight of the NYSDEC. These plans will specify the following worker and community health and safety activities during the remedial activity at the Site:

- On-site air monitoring for worker protection.
- Perimeter air monitoring for community protection.
- Use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices are considered to prevent exposures related to the work activities and to control dust and odors.
- Implementation of planned activities during the hours when the potentially exposed population is at a minimum.

4. Site Information

Appendix C contains a map identifying the location of the site.

Site Description

The Site is located at 1665-1674 Stillwell Avenue in the Bensonhurst neighborhood of Brooklyn in Kings County, NY 11223. The Site consists of a rectangular-shaped parcel, approximately 8,000-sq. ft. (0.184-acre) in size, and is bounded by Stillwell Avenue to the west, Kings Highway to the north, Quentin Road to the south, and W 13th Street to the east. The Site is zoned as R6B/C2-3, residential district with commercial overlays. The surrounding properties consist mainly of commercial, residential, and institutional site uses. The Site is currently vacant and was previously developed with a single-story concrete block building that was previously occupied by a drycleaner, thrift shop, and a dairy.

History of Site Use, Investigation, and Cleanup

The Site is currently vacant and was developed prior to 1969 with a one-story building, and a parking area in the western portion of the lot. It was initially used as an “ice cream dispensing stand” in 1955 and it was occupied for use as dairy in 1970. It was later occupied by a thrift shop in 1985 which was converted to a drycleaner in 1999.

A range of environmental issues associated with the past use of the property as a commercial laundry were identified during a subsurface investigation performed in June 2019. Several volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) associated with fuel oil and gasoline were reported above the standards in groundwater and indoor air. Chlorinated volatile organic compounds (CVOCs) typically associated with drycleaning solvents were reported above the standards in soil and indoor air. Moreover, elevated levels of metals such as Chromium, Copper, Lead, Mercury, Nickel, Zinc, Iron, Magnesium, Manganese and Sodium were also found exceeding the standards in soil and groundwater.

5. Investigation and Cleanup Process

Application

The Applicant has applied for and been accepted into New York’s Brownfield Cleanup Program as a Volunteer. This means that the Applicant was not responsible for the disposal or discharge of the contaminants or whose ownership or operation of the site took place after the discharge or disposal of contaminants. The Volunteer must fully characterize the nature and extent of contamination onsite, and must conduct a “qualitative exposure assessment,” a process that characterizes the actual or potential exposures of people, fish and wildlife to contaminants on the site and to contamination that has migrated from the site.

The Applicant in the Application proposes that the site will be used for **restricted residential** purposes.

To achieve this goal, the Applicant will conduct **cleanup** activities at the site with oversight provided by NYSDEC. The Brownfield Cleanup Agreement executed by NYSDEC, and the Applicant sets forth the responsibilities of each party in conducting these activities at the site.

Remedy Selection

When the investigation of the site has been determined to be complete, the project likely would proceed in one of two directions:

The Applicant may recommend in its investigation report that no action is necessary at the site. In this case, NYSDEC would make the investigation report available for public comment for 45-days. NYSDEC then would complete its review, make any necessary revisions, and, if appropriate, approve the investigation report. NYSDEC would then issue a "Certificate of Completion" (described below) to the Applicant.

or

The Applicant may recommend in its investigation report that action needs to be taken to address site contamination. After NYSDEC approves the investigation report, the Applicant may then develop a cleanup plan, officially called a "Remedial Work Plan". The Remedial Work Plan describes the Applicant's proposed remedy for addressing contamination related to the site.

When the Applicant submits a draft Remedial Work Plan for approval, NYSDEC would announce the availability of the draft plan for public review during a 45-day public comment period.

Cleanup Action

NYSDEC will consider public comments, and revise the draft cleanup plan, if necessary, before approving the proposed remedy. The New York State Department of Health (NYSDOH) must concur with the proposed remedy. After approval, the proposed remedy becomes the selected remedy. The selected remedy is formalized in the site Decision Document.

The Applicant may then design and perform the cleanup action to address the site contamination. NYSDEC and NYSDOH oversee the activities. When the Applicant completes cleanup activities, it will prepare a final engineering report that certifies that cleanup requirements have been achieved or will be achieved within a specific time frame. NYSDEC will review the report to be certain that the cleanup is protective of

public health and the environment for the intended use of the site.

Certificate of Completion

When NYSDEC is satisfied that cleanup requirements have been achieved or will be achieved for the site, it will approve the final engineering report. NYSDEC then will issue a Certificate of Completion (COC) to the Applicant. The COC states that cleanup goals have been achieved and relieves the Applicant from future liability for site-related contamination, subject to certain conditions. The Applicant would be eligible to redevelop the site after it receives a COC.

Site Management

The purpose of site management is to ensure the safe reuse of the property if contamination will remain in place. Site management is the last phase of the site cleanup program. This phase begins when the COC is issued. Site management incorporates any institutional and engineering controls required to ensure that the remedy implemented for the site remains protective of public health and the environment. All significant activities are detailed in a Site Management Plan.

An *institutional control* is a non-physical restriction on use of the site, such as a deed restriction that would prevent or restrict certain uses of the property. An institutional control may be used when the cleanup action leaves some contamination that makes the site suitable for some, but not all uses.

Engineering control is a physical barrier or method to manage contamination. Examples include caps, covers, barriers, fences, and treatment of water supplies.

Site management also may include the operation and maintenance of a component of the remedy, such as a system that pumps and treats groundwater. Site management continues until NYSDEC determines that it is no longer needed.

Appendix A - Project Contacts and Locations of Reports and

Information Project Contacts

For information about the site's investigation and cleanup program, the public may contact any of the following project staff:

New York State Department of Environmental Conservation (NYSDEC):

Meghan Medwid
Project Manager
NYSDEC
Division of Environmental Remediation
625 Broadway, 12th Floor Albany
NY 12233
518-402-8610

Adanna Roberts
Citizen Participation Specialist
NYSDEC Region 2
47-40 21st Street
Long Island City, NY 11101
Phone: 718-482-4966

New York State Department of Health (NYSDOH):

Anthony Perratta
Project Manager
NYSDOH
Corning Tower, Room 1787
Albany, NY 12210
518-402-7860

Locations of Reports and Information

Brooklyn Public Library – Highlawn Branch
1665 W. 13th Street at Kings Highway Brooklyn, NY 11223
Phone: 718-234-7208

Hours:

Sunday: Closed
Monday, Wednesday & Friday: 10am-6pm
Tuesday: 1pm-8pm
Saturday: 10am-5pm

Appendix B - Site Contact List

Local Government Contacts:

Eric Adams
Mayor of the City of New York
City Hall, NY 10007
Phone: 212-788-3000

Antonio Reynoso
Brooklyn Borough President
209 Joralemon Street
Brooklyn, NY 11201
Phone: 718-802-3700

William Guarinello
Chair
Brooklyn Community Board 11
2214 Bath Avenue
Brooklyn, NY 11214
Phone: 718-266-8800

Marnee Elias-Pavia
District Manager
2214 Bath Avenue
Brooklyn, NY 11214

Charles Barron
New York City Council 42nd District
447 New Lots Avenue
Brooklyn, NY 11207
Phone: 718-649-9495

Eric Gonzalez
Kings County District Attorney
350 Jay Street
Brooklyn, NY 11201
Phone: 718-250-3470

Public Water Supplier:

New York City Department of Environmental Protection
Attn: Rohit T. Aggarwal
59-17 Junction Blvd

Queens, NY 11368

Schools and Daycare Facilities:

PS/IS 686 Brooklyn School of Inquiry
50 Ave P
Brooklyn, NY 11204
Phone: 718-621-5730

Public School 97 - The Highlawn School
1855 Stillwell Ave
Brooklyn, NY 11223

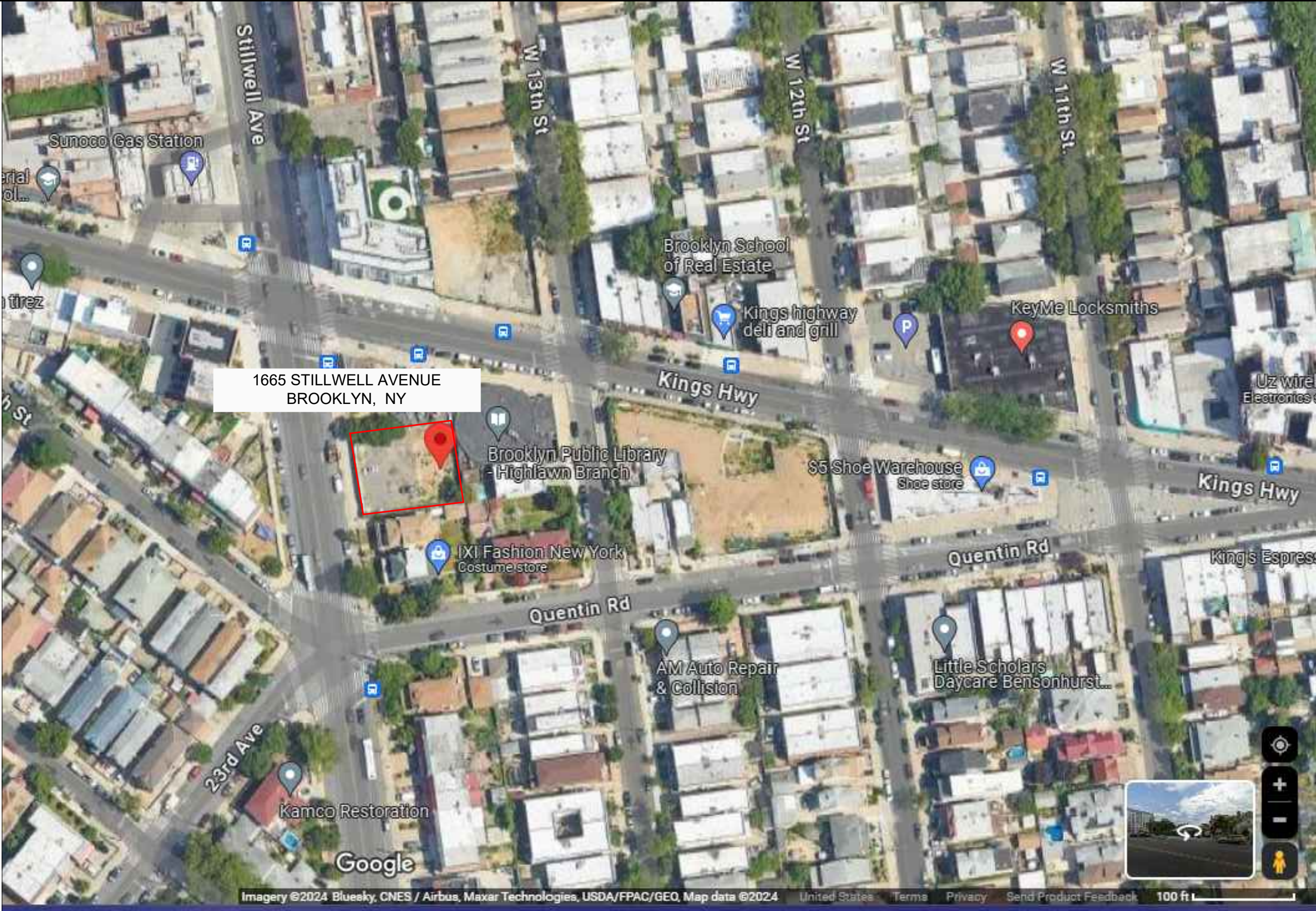
The Leaning Experience
412 Kings Hwy
Brooklyn, NY 11223
Phone: 718-627-7340

Little Scholars Daycare Bensonhurst
52 Quentin Road
Brooklyn, NY 11223
Phone: 917-475-0001

Happy Club Children's Center
125 Kings Hwy
Brooklyn, NY 11223
Phone: 347-307-4833

Gold Material Montessori School
105 Kings Hwy
Brooklyn, NY 11214
Phone: 718-253-2552

Appendix C - Site Location Map



PREPARED BY:



**TYLL ENGINEERING &
CONSULTING PC**

169 Commack Road, Suite H173, Commack, NY 11725
PHONE: (631) 629-5373 info@tyllengineering.com

TITLE:

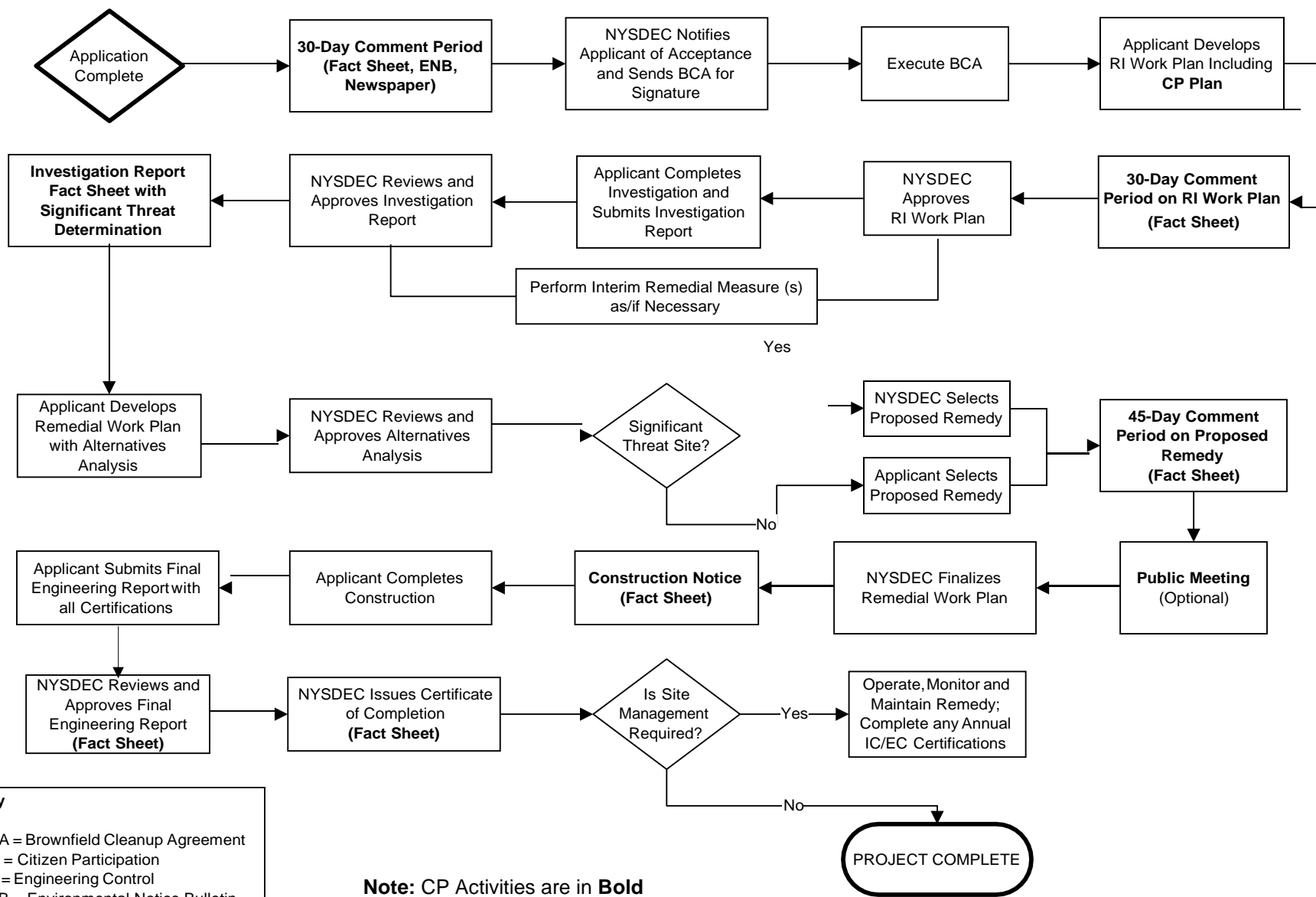
SITE LOCATION MAP

1665 STILLWELL AVENUE
BROOKLYN, NY

DRAWN:	SCALE:	DATE:	PROJECT NO.:
-	NTS	02/14/2024	RSK2305
CHECKED:	APPROVED:	REVISION:	NOTES:
KT	KT	-	-

FIGURE NO.:
1

Appendix D– Brownfield Cleanup Program Process



Appendix D

Quality Assurance Project Plan

QUALITY ASSURANCE PROJECT PLAN (QAPP)

**1665 STILLWELL AVENUE
BROOKLYN, NY 11223
NYSDEC SITE NO. C224307**

SUBMITTED TO:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION, BUREAU B
625 BROADWAY, 12th FLOOR ALBANY, NEW
YORK 12233-7016

PREPARED FOR:
REFULGENCE LLC
8738 20th AVENUE
BROOKLYN, NY 11214

PREPARED BY:
Tyll Engineering and
Consulting PC
169 Commack Road, Suite
H173 Commack, NY 11725
631-629-5373

FEBRUARY 2024



TYLL ENGINEERING & CONSULTING PC

TABLE OF CONTENTS

Table of Contents

1.1 Project Description & Objectives	3
1.2 Project Organization Remedial Engineer	3
Project Manager	3
Analytical Laboratory	4
Data Validation	4
2.0 FIELD SAMPLING PROCEDURES	4
2.1 Soil Samples	4
2.2 Field Equipment Calibration	4
2.3 Decontamination Procedures	5
2.4 PFAS Sample Collection	Error! Bookmark not defined.
2.4.1 PFAS Target Analyte List	Error! Bookmark not defined.
3.0 SAMPLE HANDLING AND ANALYSIS	5
3.1 Sample Custody Documentation	5
3.2 Sample Shipment	6
3.3 Laboratory Analysis	6
3.4 Field/Laboratory Quality Assurance/Quality Control	7
4.0 QA/QC OBJECTIVES FOR DATA MEASUREMENT	9
4.1 Completeness	9
4.2 Representativeness	9
4.3 Comparability	10
4.4 Precision and Accuracy	10
5.0 DATA USABILITY AND VALIDATION	12
6.0 CORRECTIVE ACTION	13
APPENDIX A	RESUMES
APPENDIX B	LABORATORY QUALS PACK & CERTIFICATIONS

1.0 QUALITY ASSURANCE PROJECT PLAN (QAPP)

1.1 Project Description & Objectives

This Quality Assurance Project Plan (QAPP) has been prepared by Tyll Engineering and Consulting, P.C (TES), on behalf of Refulgence LLC for the site located at 1665 Stillwell Avenue, Brooklyn, New York (NYSDEC BCP Site C224307). The QAPP presents data quality objectives (DQO), methods and QA/QC requirements associated with sample collection and laboratory analysis to be performed. This QAPP specifies analytical methods and procedures to be used to ensure that data collected during proposed remedial activities are precise, accurate, representative, comparable, complete and meet sensitivity requirements for the project.

The objective of the proposed sampling is to investigate and characterize the nature and extent of contamination on-site and possibly migrating off-site and to provide sufficient information to evaluate remedial alternatives. The QAPP was prepared in accordance with NYSDEC DER-10: Technical Guidance for Site Investigation and Remediation, Section 2.

1.2 Project Organization Remedial

Engineer

The Remedial Engineer for this project will be Karen Tyll, P.E. of TES. The Remedial Engineer is a registered Professional Engineer licensed by the State of New York. The Remedial Engineer will be responsible for implementation of the Remedial Action and future remedial program for the site. The Remedial Engineer will certify in the Final Engineering Report that remedial action was observed by qualified environmental professionals as well as that the remedial action was performed in accordance with the NYSDEC approved RAWP.

Project Manager

RSK Project Manager (Danny Singh) will be responsible for the day-to-day project management, task leadership, and project engineering support and for the planning and implementation of RI activities and providing oversight of all field work performed. The Project Manager is responsible for ensuring that the requirements of the RAWP are implemented. Drumita Dmello will act as the Site-specific Construction Health and Safety Officer (HSO). Resumes for project staff are included in Appendix A.

Analytical Laboratory

Phoenix Environmental Laboratories, Inc. (Phoenix) of Manchester, Connecticut, A NYSDOH Environmental Laboratory Accreditation Program (ELAP) certified laboratory (ELAP Number 11301) will be contracted to perform required analyses and reporting, including Analytical Services Protocol (ASP) Category B Deliverables, which will allow for data validation. Phoenix will be responsible for sample container preparation, sample custody in the laboratory and completion of the required analysis. The Laboratory Director will ensure that laboratory QA procedures are followed and an acceptable laboratory report is prepared and submitted. Laboratory qualifications, standard operating procedures (SOPs) and certificates are included in Appendix B.

Data Validation

Koan Government Solutions, LLC (KGS) of Exton, Pennsylvania, will serve as the independent third-party data validator for the project. (KGS) will be contracted to perform data validation and to provide Data Usability Summary Reports (DUSRs) for all analytical data obtained during the remedial investigation.

2.0 FIELD SAMPLING PROCEDURES

Soil and groundwater sampling will be conducted in accordance with the protocols established in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation dated May 2010. Soil vapor sampling will be performed in accordance with NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006, updated May 2017).

2.1 Soil Samples

Soil samples will be visually classified and screened using a PID to assess potential impacts from VOCs. Soil samples to be analyzed for VOCs will be collected using Terra Core samplers. Samples to be analyzed for parameters other than VOCs will be placed into glass jars provided by the laboratory using decontaminated stainless-steel trowels or sterile sampling scoops. After sampling, all sample jars will be capped and securely tightened and placed in coolers with ice and maintained at 4°C until they are transported to the laboratory.

2.2 Field Equipment Calibration

Field equipment will be calibrated daily prior to use. Equipment will be calibrated in accordance with manufacturers' specifications. Equipment calibrations will be recorded in the field logbook.

2.3 Decontamination Procedures

Sampling equipment that will be reused during the remedial activities will be decontaminated prior to each use. The following decontamination procedures will be performed:

- Use laboratory grade glassware detergent and tap water scrub to remove visual contamination
- Generous tap water rinse
- Distilled water rinse

3.0 SAMPLE HANDLING AND ANALYSIS

To ensure quality data acquisition and collection of representative samples, procedures will be implemented to minimize sample degradation or contamination. These include procedures for preservation of the samples, as well as sample packaging, shipping procedures, and quality assurance/quality control.

All information relating to field sampling must be recorded in a bound logbook designated to this project with numbered pages. This will include data transcribed on sample labels and COC forms as a check on sample identification. The following entries will be made in the logbook: daily weather conditions, general observations, preservation, sample collector's name, date, time, sample code, sample type, sample treatment and a description of the sampling location. Site photographs to document field sampling events.

3.1 Sample Custody Documentation

The purpose of documenting sample custody is to ensure that the integrity and handling of the samples is not subject to question. Sample custody will be maintained from the point of sampling through the analysis (and return of unused sample portion, if applicable).

Each individual collecting a sample is personally responsible for the care and custody of the samples. All sample labels should be pre-printed or filled out using waterproof ink. The following information will be shown on labels:

- Sample number
- Name of collector
- Date and time of collection
- Place of collection
- Preservation method
- Type of analysis

The COC form will be completed by field personnel and accompany every sample shipment to document sample possession from the time of collection until the sample has been received by the

laboratory. The COC form includes the following information:

- Laboratory that will perform the analysis;
- Names of the samplers;
- Sample I.D. No.;
- Date and time of sample collection;
- Sample matrix or source, i.e., soil;
- Sample location or method;
- Whether the sample has been filtered, fixed or preserved;
- Number of sample containers;
- Type of analysis including EPA method number, where appropriate;
- Project name and number;
- Name of the person to whom the results should be addressed;
- Name of the person/company to whom the invoice will be addressed;
- Signature(s) of the samples;
- Signature(s) of anyone who had custody of the samples, i.e., delivered the samples; and
- Date and time that sample custody was relinquished by RSK and the sample was received by the laboratory.

All samples being shipped offsite for analysis must be accompanied by a properly completed chain of custody form. The sample numbers will be listed on the chain of custody form. When transferring the possession of samples, individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person and/or to/from a secure storage area and/or to the shipper, and/or to the laboratory.

Samples will be packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate signed custody record enclosed in each sample box or cooler. Shipping containers will be locked and/or secured with strapping tape in at least two locations for shipment to the laboratory.

3.2 Sample Shipment

Soil and groundwater sample containers will be placed in coolers. Ice stored in sealed bags will be placed around sample containers and cushioning material will be placed around the containers if necessary. Coolers will be taped closed. All samples will be picked up by a Phoenix Environmental Laboratory courier within 24 hours of collection and transported to their Manchester, Connecticut lab in a cooler packed with ice in order to maintain samples at a temperature of 4° C.

3.3 Laboratory Analysis

Requirements for sample containers, preservation and holding times are summarized in tables shown below. Phoenix Environmental Laboratories (NYSDOH ELAP # 11301) is proposed to perform analysis of samples collected during the remedial action.

SOIL ANALYTICAL METHODS

Analyte/Analyte Group	Matrix	Method/SOP	Container(s) (number, size & type per sample)	Preservation	Holding Time	Estimated Number of Samples to be Collected
TAL Metals (and Mercury)	Soil	USEPA 6010D	1x8 oz, glass	Cool $\leq 4^{\circ}\text{C}$	180 days	8
TCL VOCs	Soil	USEPA 8260C	3 x 40 ml VOA, glass vial	1 x Methanol 3 x DI H ₂ O Cool $\leq 4^{\circ}\text{C}$	14 days	8
TCL SVOCs	Soil	USEPA 8270D	1x8 oz, glass	Cool $\leq 4^{\circ}\text{C}$	40 days	8
PCBs and Pesticides	Soil	USEPA 8082A	1x8 oz, glass	Cool $\leq 4^{\circ}\text{C}$	40 days	8

3.4 Field/Laboratory Quality Assurance/Quality Control

The primary DQO of the remedial investigation soil sampling, soil vapor and groundwater sampling are that data be accurate and precise and, hence, representative of the actual site conditions. Accuracy refers to the ability of the laboratory to obtain a true value (i.e., compared to a standard) and is assessed through the use of laboratory quality control (QC) samples, including laboratory control samples and matrix spike samples, as well as through the use of surrogates, which are compounds not typically found in the environment that are injected into the samples prior to analysis. Precision refers to the ability to replicate a value and is assessed through both field and laboratory duplicate samples.

Sensitivity is also a critical issue in generating representative data. Laboratory equipment must be of sufficient sensitivity to detect target compounds and analytes at levels below NYSDEC standards and guidelines whenever possible. Equipment sensitivity can be decreased by field or laboratory contamination of samples and by sample matrix effects. Assessment of instrument sensitivity is performed through the analysis of reagent blanks, near-detection-limit standards, and response factors. Potential field and/or laboratory contamination is assessed through use of trip blanks, method blanks, and equipment rinse blanks (also called “field blanks”).

- *Instrument Calibration*

Calibration curves will be developed for each of the compounds to be analyzed. Standard concentrations and a blank will be used to produce the initial curves. The development of calibration curves and initial calibration response factors must be consistent with method requirements presented in the most recent version of NYSDEC ASP 07/2005).

- *Continuing Instrument Calibration*

The initial calibration curve will be verified every 12 hours by analyzing one calibration standard. The standard concentration will be the midpoint concentration of the initial calibration curve. The

calibration check compound must come within 25% relative percent difference (RPD) of the average response factor obtained during initial calibration. If the RPD is greater than 25%, then corrective action must be taken as provided in the specific methodology.

- *Method Blanks*

Method blank or preparation blank is prepared from an analyte free matrix which includes the same reagents, internal standards and surrogate standards as the related samples. It is carried through the entire sample preparation and analytical procedure. A method blank analysis will be performed once for each 12-hr. period during the analysis of samples for volatiles. An acceptable method blank will contain less than two (2) times the CRQL of methylene chloride, acetone and 2-butanone. For all other target compounds, the method blank must contain less than or equal to the CRQL of any single target compound. For non-target peaks in the method blank, the peak area must be less than 10 percent of the nearest internal standard. The method blank will be used to demonstrate the level of laboratory background and reagent contamination that might result from the analytical process itself.

- *Trip Blanks.*

Trip blanks consist of a single set of sample containers filled at the laboratory with deionized, laboratory-grade water. The water used will be from the same source as that used for the laboratory method blank. The containers will be carried into the field and handled and transported in the same way as the samples collected that day. Analysis of the trip blank for VOCs is used to identify contamination from the air, shipping containers, or from other items coming in contact with the sample bottles. (The bottles holding the trip blanks will be not opened during this procedure.) A complete set of trip blanks will be provided with each shipment of samples to the certified laboratory.

- *Surrogate Spike Analysis*

For organic analyses, all samples and blanks will be spiked with surrogate compounds before purging or extraction in order to monitor preparation and analyses of samples. Surrogate spike recoveries shall fall within the advisory limits in accordance with the NY5DEC ASP protocols for samples falling within the quantification limits without dilution.

- *Matrix Spike / Matrix Spike Duplicate / Matrix Spike Blank (MS/MSDIMSB) Analysis*

MS, MSD and MSB analyses will be performed to evaluate the matrix effect of the sample upon the analytical methodology along with the precision of the instrument by measuring recoveries. The MS / MSD / MSB samples will be analyzed for each group of samples of a similar matrix at a rate of 5% (one for every 20 field samples). The RPD will be calculated from the difference between the MS and MSD. Matrix spike blank analysis will be performed to indicate the appropriateness of the spiking solution(s) used for the MS/MSD. 10% of the samples of each matrix should be sampled and analyzed as Duplicates.

All analyses will be performed in accordance with the July 2005 NYSDEC ASP using USEPA SW-846 methods. All remedial investigation analytical data will be reported in NYSDEC ASP Category B

deliverables.

4.0 QA/QC OBJECTIVES FOR DATA MEASUREMENT

In cases where NYSDOH ELAP Certification exists for a specific group or category of parameters, the laboratories performing analysis in connection with this project will have appropriate NYSDOH ELAP Certification. Analytical Service Protocol (ASP, June 2000) Category B deliverables are required for all samples.

Detection limits set by NYSDEC-ASP will be used for all sample analyses unless otherwise noted. If NYSDEC-ASP-dictated detection limits prove insufficient to assess project goals (i.e., comparison to drinking water standards or attainment of Applicable or Relevant and Appropriate Requirements [ARARs]), then ASP Special Analytical Services (SAS) or other appropriate methods will be utilized.

The quality assurance/quality control objectives for all measurement data include completeness, representativeness, comparability, precision and accuracy.

4.1 Completeness

The analyses performed must be appropriate and inclusive. The parameters selected for analysis are chosen to meet the objectives of the study.

Completeness of the analyses will be assessed by comparing the number of parameters intended to be analyzed with the number of parameters successfully determined and validated. Data must meet QC acceptance criteria for 100 percent or more of requested determinations.

4.2 Representativeness

Samples must be taken of the population and, where appropriate, the population will be characterized statistically to express the degree to which the data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process, or environmental condition.

Non-dedicated sampling devices will be cleaned between sampling points by washing and rinsing with pesticide-grade methanol, followed by a thorough rinse with distilled water. Two types of blank samples will accompany each sample set where Target Compound List (TCL) volatiles are to be analyzed (water matrix only). A trip blank, consisting of a 40 ml VOA vial of organic-free water prepared by the laboratory, will accompany each set of sample bottles from the laboratory to the field and back. This bottle will remain sealed throughout the shipment and sampling process. This blank will be analyzed for TCL volatile organic

compounds along with the groundwater samples to ensure that contamination with TCL volatile compounds has not occurred during the bottle preparation, shipment and sampling phase of the project. In order to check for contaminant carryover when non-dedicated sampling equipment is used, a rinsate blank will be submitted to the laboratory. This blank will also be analyzed for TCL volatile organic compounds.

The TCL compounds are identified in the United States Environmental Protection Agency (USEPA) Contract Laboratory Program dated 10/2016 or as periodically updated.

The analysis results obtained from the determination of identical parameters in field duplicate samples can be used to further assess the representativeness of the sample data.

4.3 Comparability

Consistency in the acquisition, preparation, handling and analysis of samples is necessary in order for the results to be compared where appropriate. Additionally, the results obtained from analyses of the samples will be compared with the results obtained in previous studies, if available.

To ensure the comparability of analytical results with those obtained in previous or future testing, all samples will be analyzed by NYSDEC-approved methods. The NYSDEC-ASP mandated holding times for various analyses will be strictly adhered to.

4.4 Precision and Accuracy

The validity of the data produced will be assessed for precision and accuracy. Analytical methods which will be used include gas chromatography/mass spectrometry (GC/MS), gas chromatography (GC), colorimetry, atomic spectroscopy, gravimetric and titrimetric techniques. The following outlines the procedures for evaluating precision and accuracy, routine monitoring procedures, and corrective actions to maintain analytical quality control. All data evaluations will be consistent with NYSDEC-ASP procedures (June 2000). Data will be 100 percent compliant with NYSDEC-ASP requirements.

The number of duplicate, spiked and blank samples analyzed will a minimum of 1 duplicate for every 20 samples per each medium of groundwater and soil. The inclusion and frequency of analysis of field blanks will be on the order of one per every 20 samples (soil) for the aqueous matrix field blanks will be collected at a frequency of one per day. Samples to be analyzed for volatile organic compounds will be accompanied by a trip blank for each shipment and field blanks (water matrix) or field blanks (soil).

Quality assurance audit samples will be prepared and submitted by the laboratory QA manager for each analytical procedure used. The degree of accuracy and the recovery of analyte to be expected for the analysis of QA samples and spiked samples is dependent upon the matrix, method of analysis, and compound or element being determined.

The concentration of the analyte relative to the detection limit is also a major factor in

determining the accuracy of the measurement.

The lower end of the analytical range for most analyses is generally accepted to be five times the detection limit. At or above this level, the determination and spike recoveries for metals in water samples will be expected to range from 75 to 125 percent. The recovery of organic surrogate compounds and matrix spiking compounds determined by GC/MS will be compared to the guidelines for recovery of individual compounds as established by the United States Environmental Protection Agency (USEPA) Contract Laboratory Program dated 7/85 or as periodically updated. The quality of results obtained for inorganic ion and demand parameters will be assessed by comparison of QC data with laboratory control charts for each test.

5.0 DATA USABILITY AND VALIDATION

The main purpose of the data is for use in defining the extent of contamination at the site, to allow for evaluation of potential human health and ecological exposure assessments and to support remedial action decisions. In order to achieve this, data usability will be performed as described below.

Data Usability and Validation Requirements

Data usability and validation are performed on analytical data sets primarily to confirm that sampling and chain-of-custody documentation are complete, sample IDs may be tied to specific sampling locations, samples were analyzed within required holding times and analyses are reported in conformance with NYSDEC, Category B data deliverable requirements as applicable to the methods utilized.

Independent third-party data validation will be performed on 5% of the sample data or on one sample from each sample delivery group (SDG) whichever is greater. KGS of Exton, PA, will serve as the independent third-party data validator for the project.

Review of Field Data Package

The field data package will be reviewed by the project QA officer and Project Manager for completeness and accuracy. The RSK Project Manager will check field logbooks weekly to ensure that they are properly maintained and updated. If not, corrective action will be taken immediately. Data validation checklists will be used as guides in evaluating sample collection, field records and analytical performance. The field data package will include all field records and measurements developed by the sampling team. The field data package validation procedure will consist of:

- A review of field data contained in sampling logs for completeness.
- A verification that equipment blanks and field blanks were properly prepared, identified and analyzed.
- A check on field measured parameters to ensure proper equipment calibration.
- A review of COC forms for proper completion, signatures of field personnel and the laboratory sample custodian dates.

6.0 CORRECTIVE ACTION

Review and implementation of systems and procedures may result in recommendations for corrective action. Any deviations from the specified procedures within approved project plans due to unexpected site-specific conditions shall warrant corrective action. All errors, deficiencies, or other problems shall be brought to the immediate attention of the RSK PM, who in turn shall contact the Quality Assurance/Data Quality Manager or his designee (if applicable).

Procedures have been established to ensure that conditions adverse to data quality are promptly investigated, evaluated and corrected. These procedures for review and implementation of a change are as follows:

- Define the problem.
- Investigate the cause of the problem.
- Develop a corrective action to eliminate the problem, in consultation with the personnel who defined the problem and who will implement the change.
- Complete the required form describing the change and its rationale (see below for form requirements).
- Obtain all required written approvals.
- Implement the corrective action.
- Verify that the change has eliminated the problem.

During the field investigation, all changes to the sampling program will be documented in field logs/sheets and the RSK PM advised.

If any problems occur with the laboratory or analyses, the laboratory must immediately notify the PM, who will consult with other project staff. All approved corrective actions shall be controlled and documented.

All corrective action documentation shall include an explanation of the problem and a proposed solution which will be maintained in the project file or associated logs. Each report must be approved by the necessary personnel (e.g., the PM) before implementation of the change occurs. The PM shall be responsible for controlling, tracking, implementing and distributing identified changes.

Appendix A – Resumes

Dhanraj D. Singh

251 Vincent Drive | East Meadow, NY 11554 | 347-728-0768 | ghanrajdsingh@gmail.com

Objective

To find a challenging career in an established organization so that I may grow professionally, while earning a good reputation amongst my peers.

PROFESSIONAL EXPERIENCE

DC Environmental Services, Inc. (*Brooklyn, NY*)

2004 - 2015

- Managed the operations and productivity of the division of environmental remediation
- Performed and prepare Environmental Phase I and II (ESA) reports
- Planning, coordinating and implementation of environmental Phases I, II and III
- Preparation and review of Closure Reports for BCP/VCP/Rezoned development projects
- Preparation of Site-Specific Health and Safety Plans
- Preparation of Remedial/Corrective Action Plans
- Oversight/implementation of Site-Specific Health and Safety Plans with job oversight, toolbox meetings
- Environmental Site Assessments and Remediation Costing
- Direct communicational with clients, Case Managers of NYSDEC, NYCDEP & NYCOER
- Performed Geoprobe investigations and Ground Penetrating Radar survey
- Collection of soil, groundwater and soil gas samples; performed field-screening
- Collection of Asbestos sampling; prepare inspection reports based on findings

BSD Environmental Group (*Brooklyn, NY*)

2015 - 2018

D.b.a. RSK Environmental Group (*Brooklyn, NY*)

2018 - present

- Managed the operations and productivity
- Perform Environmental Phase I and II (ESA) reports
- Planning, coordinating and implementation of environmental Phases I, II and III
- Preparation and review of Closure Reports for BCP/VCP/Rezoned development projects
- Preparation of Site-Specific Health and Safety Plans
- Preparation of Remedial/Corrective Action Plans
- Oversight and implementation of Site-Specific Health and Safety Plans; job oversight, toolbox meetings
- Environmental Site Assessments and Remediation Costing
- Direct communicational with clients, Case Managers of NYSDEC, NYCDEP & NYCOER
- Performed Geoprobe investigations and Ground Penetrating Radar survey
- Collection of soil, groundwater and soil gas samples; performed field-screening
- Collection of Asbestos sampling; prepare inspection reports based on findings
- Perform Lead-based paint survey.

EDUCATION

NYC College of Technology (*Brooklyn, NY*)

2008

St. Georges College & School of Business and Computer Science (*Trinidad, W.I.*)

1990 - 1999

Certification and Training

2005 - 2022

- 62 Hour SST Supervisor approved by New York City Department of Buildings
- 30 Hour OSHA Construction Safety and Health - 29 CFR 1926
- 40 Hour plus annual refresher - OSHA HAZWOPER 29 CFR 1910.120
- 8 Hour plus annual refresher - OSHA HAZWOPER Site Supervisor 29 CFR 1910.120(e)(4)
- NYSDOL Asbestos Inspector
- OSHA Confined Space Awareness - 29 CFR 1910.146
- 4-Hour Supported Scaffolding Safety - 29 CFR 1926.451
- Mold Inspection and Assessment
- Lead-based Paint Inspector EPA - TSCA Section 402/40 CFR Part 745.226
- EPA Lead Safe Certified Renovator
- NYSDEC Class A/B Operator - 6 NYCRR 613.25 & 6 NYCRR 598.12
- Mt. Vernon Fire Department - Supervise and/or install oil burner equipment
- Yonkers Fire Department - Tank Pump Installer Permit
- NCDOH Certificate of Fitness - Article 12, Section 1.9(j) Tank Installer/Remover

DRUMITA GABRIEL DMELLO

dgdmello389@gmail.com | +1(646)249-6129 | www.linkedin.com/in/drumita-dmello/

A proficient Environmental Consultant reflecting skillful individuality in solo and team projects, and dedication to a career with an ability to adapt to new situations and grasp new software/techniques. 3+ years of experience in the capacity of an Environmental Consultant within a dynamic workspace. Directly led several NYS & NYC projects assigned in Voluntary Cleanup Program (VCP) and Brownfield Cleanup Program (BCP) from the initial stage of Phase-I Site Assessment to the final stage (Phase-III) of Remedial Cleanup and reporting.

EDUCATION

University of New Haven, West Haven, CT	May 2020
Master of Science, Environmental Science	GPA: 3.73/4
Concentration: Geographical Information Systems (GIS)	
St. Xavier's College, Ahmedabad, Gujarat	April 2017
Bachelor of Science, Chemistry	GPA: 7/10

WORK EXPERIENCE

RSK Environmental Group LLC: Environmental Consultant

October 2020 – Present

- Experience in preparation of Environmental Assessment Reports (Phase 1, 2, 3) in compliance with NYS & NYC Environmental Rules & Regulations (NYSDEC Part 375 and DER-10).
- Management of cost estimation, and budgeting during the initiation of a project along with efficient client organization and sub-contractor communication and oversight during field activities.
- Implementing project work plans and on-site health and safety monitoring during site activities.
- Reading engineering plans and creating remedial investigation and remedial action diagrams utilizing AutoCAD 2022.
- Organizing staff briefing, and safety procedure run-through prior to field activities.
- Oversight and handling of soil samples, collection of samples utilizing spoons/macro-core liners in lab-provided glassware; groundwater collection utilizing grab sample technique/low-flow pumps and air sample collection utilizing 2 and 8-hour flow controllers.
- Participation in NY state and city staff meetings, project planning, and conflict resolution.
- Planning and compiling technical reports (Phase-I Reports, Remedial Investigation work plans and reports (RIWP, RIR), Remedial Action Work plans and reports (RAWP, RAR), Site Characterization Report (SCR), Tank Closure Reports (TCR) and Spill Closure Reports for local clients, city, and state projects.

Walkspan, Inc.: GIS and Data Specialist

August 2020 – July 2021

- Collected and projected GIS data according to a particular coordinate system in ArcGIS Pro, QGIS and ArcGIS Map Products & Online for map-making and feasibility analysis.
- Analyzed the GIS data for Urban mapping of three (3) US cities, namely New York City, Seattle, and Phoenix.
- Designed ArcGIS Story Map for the city of Seattle to showcase the importance and reach of sidewalks.
- Designed web viewing applications utilizing ArcGIS Online to outline the overall idea of Walkability for New York City.

City of West Haven, Mayor's Office: Sustainability Intern

June 2019 – August 2019

- Achieved “Bronze” certification of sustainable town for West Haven awarded by Sustainable CT and worked with the municipal team to plan and analyze the city management and zoning documents.
- Created outlined professional GIS Web Maps for the City of West Haven as inventories for Open Spaces, Brownfield Sites, and Natural Resources using Web GIS and ArcGIS.
- Exercised remote work to gain knowledge about the city’s demographics, Natural Diversity, present Environmental Protection Laws, and city placemaking projects and ideas.

ADDITIONAL

- **Technical Expertise:** Environmental Impact Site Assessments and reports, OSHA, USEPA RCRA, CERCLA, NYSDEC Rules and Regulation, NYC Rules and Regulations, Environmental Pollution Dynamics, Toxicology, and Chemistry.
- **Certification:** Associate Project Management, 8-hour OSHA HAZWOPER Refresher, 8-hour OSHA Supervisor Initial.

Appendix B – Laboratory Package

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:*

Bacteriology

Coliform, Total / E. coli (Qualitative)	SM 21, 23 9222A,B,C SM 20, 21-23 9223B (-04) (Colilert)
E. coli (Enumeration)	SM 21, 23 9222A,B,C SM 20, 21-23 9223B (-04) (Colilert)
Enterococci	SM 23 9230D (Enterolert)
Heterotrophic Plate Count	SM 20, 21-23 9215B (-04)

Chlorinated Acids

2,4,5-TP (Silvex)	EPA 515.3
2,4-D	EPA 515.3
Dalapon	EPA 515.3
Dicamba	EPA 515.3
Dinoseb	EPA 515.3
Pentachlorophenol	EPA 515.3
Picloram	EPA 515.3

Disinfection By-products

Bromochloroacetic acid	EPA 552.2
Dibromoacetic acid	EPA 552.2
Dichloroacetic acid	EPA 552.2
Monobromoacetic acid	EPA 552.2
Monochloroacetic acid	EPA 552.2
Trichloroacetic acid	EPA 552.2

Fuel Additives

Methyl tert-butyl ether	EPA 524.2
Naphthalene	EPA 524.2

Metals I

Arsenic, Total	SM 19, 21-23 3113B (-04,-10)
----------------	------------------------------

Serial No.: 66334

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:*

Metals I

Arsenic, Total	EPA 200.9 Rev. 2.2
	EPA 200.8 Rev. 5.4
Barium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Cadmium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Chromium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Copper, Total	EPA 200.5
	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Iron, Total	EPA 200.7 Rev. 4.4
Lead, Total	EPA 200.5
	SM 19, 21-23 3113B (-04,-10)
	EPA 200.9 Rev. 2.2
Manganese, Total	EPA 200.8 Rev. 5.4
	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Mercury, Total	EPA 245.1 Rev. 3.0
Selenium, Total	SM 19, 21-23 3113B (-04,-10)
	EPA 200.9 Rev. 2.2
	EPA 200.8 Rev. 5.4
Silver, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Zinc, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4

Serial No.: 66334

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:*

Metals II

Aluminum, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4
Antimony, Total	SM 19, 21-23 3113B (-04,-10) EPA 200.9 Rev. 2.2 EPA 200.8 Rev. 5.4
Beryllium, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4
Molybdenum, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4
Nickel, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4
Thallium, Total	SM 19, 21-23 3113B (-04,-10) EPA 200.9 Rev. 2.2 EPA 200.8 Rev. 5.4
Vanadium, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4

Metals III

Boron, Total	EPA 200.7 Rev. 4.4
Calcium, Total	EPA 200.7 Rev. 4.4
Magnesium, Total	EPA 200.7 Rev. 4.4
Potassium, Total	EPA 200.7 Rev. 4.4
Sodium, Total	EPA 200.7 Rev. 4.4
Uranium (Mass)	EPA 200.8 Rev. 5.4

Methylcarbamate Pesticides

3-Hydroxy Carbofuran	EPA 531.2
Aldicarb	EPA 531.2

Serial No.: 66334

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:*

Methylcarbamate Pesticides

Aldicarb Sulfone	EPA 531.2
Aldicarb Sulfoxide	EPA 531.2
Carbaryl	EPA 531.2
Carbofuran	EPA 531.2
Methomyl	EPA 531.2
Oxamyl	EPA 531.2

Microextractables

1,2,3-Trichloropropane, Low Level	EPA 504.1
1,2-Dibromo-3-chloropropane, Low Le	EPA 504.1
1,2-Dibromoethane, Low Level	EPA 504.1

Miscellaneous

1,4-Dioxane	EPA 522
Benzo(a)pyrene	EPA 525.3
Bis(2-ethylhexyl) phthalate	EPA 525.3
Di (2-ethylhexyl) adipate	EPA 525.3
Diquat	EPA 549.2
Glyphosate	EPA 547
Hexachlorobenzene	EPA 525.3
Hexachlorocyclopentadiene	EPA 525.3
Odor	SM 21-23 2150 B (-97)
Organic Carbon, Dissolved	SM 21-23 5310B (-00)
Organic Carbon, Total	SM 21-23 5310B (-00)
Surfactant (MBAS)	SM 21-23 5540C (-00)
Turbidity	SM 21-23 2130 B (-01)
UV 254	SM 21-23 5910B (-00,-11)



Serial No.: 66334

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:*

Non-Metals

Alkalinity	SM 21-23 2320B (-97)
Calcium Hardness	EPA 200.7 Rev. 4.4 SM 18-22 2340B (-97)
Chloride	EPA 300.0 Rev. 2.1 SM 21-22 4500-Cl- E (-97)
Color	SM 21-23 2120B (-01)
Cyanide	EPA 335.4 Rev. 1.0
Fluoride, Total	EPA 300.0 Rev. 2.1 SM 21-23 4500-F C (-97)
Nitrate (as N)	EPA 353.2 Rev. 2.0 EPA 300.0 Rev. 2.1
Nitrite (as N)	EPA 353.2 Rev. 2.0 EPA 300.0 Rev. 2.1
Orthophosphate (as P)	SM 19, 21-23 4500-P F (-99) SM 19, 21-23 4500-P E (-99)
Solids, Total Dissolved	SM 21-23 2540C (-97)
Specific Conductance	SM 21-23 2510B (-97)
Sulfate (as SO ₄)	EPA 300.0 Rev. 2.1 SM 19, 21-23 4500-SO ₄ D (-97)

Organohalide Pesticides

Alachlor	EPA 525.3
Aldrin	EPA 525.3
Atrazine	EPA 525.3
Butachlor	EPA 525.3
Chlordane Total	EPA 525.3
Dieldrin	EPA 525.3
Endrin	EPA 525.3

Serial No.: 66334

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:*

Organohalide Pesticides

Heptachlor	EPA 525.3
Heptachlor epoxide	EPA 525.3
Lindane	EPA 525.3
Methoxychlor	EPA 525.3
Metolachlor	EPA 525.3
Metribuzin	EPA 525.3
Propachlor	EPA 525.3
Simazine	EPA 525.3
Toxaphene	EPA 525.3

Polychlorinated Biphenyls

PCB Screen	EPA 508
------------	---------

Trihalomethanes

Bromodichloromethane	EPA 524.2
Bromoform	EPA 524.2
Chloroform	EPA 524.2
Dibromochloromethane	EPA 524.2
Total Trihalomethanes	EPA 524.2

Volatile Aromatics

1,2,3-Trichlorobenzene	EPA 524.2
1,2,4-Trichlorobenzene	EPA 524.2
1,2,4-Trimethylbenzene	EPA 524.2
1,2-Dichlorobenzene	EPA 524.2
1,3,5-Trimethylbenzene	EPA 524.2
1,3-Dichlorobenzene	EPA 524.2
1,4-Dichlorobenzene	EPA 524.2
2-Chlorotoluene	EPA 524.2

Serial No.: 66334

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:*

Volatile Aromatics

4-Chlorotoluene	EPA 524.2
Benzene	EPA 524.2
Bromobenzene	EPA 524.2
Chlorobenzene	EPA 524.2
Ethyl benzene	EPA 524.2
Hexachlorobutadiene	EPA 524.2
Isopropylbenzene	EPA 524.2
n-Butylbenzene	EPA 524.2
n-Propylbenzene	EPA 524.2
p-Isopropyltoluene (P-Cymene)	EPA 524.2
sec-Butylbenzene	EPA 524.2
Styrene	EPA 524.2
tert-Butylbenzene	EPA 524.2
Toluene	EPA 524.2
Total Xylenes	EPA 524.2

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 524.2
1,1,1-Trichloroethane	EPA 524.2
1,1,2,2-Tetrachloroethane	EPA 524.2
1,1,2-Trichloroethane	EPA 524.2
1,1-Dichloroethane	EPA 524.2
1,1-Dichloroethene	EPA 524.2
1,1-Dichloropropene	EPA 524.2
1,2,3-Trichloropropane	EPA 524.2
1,2-Dichloroethane	EPA 524.2
1,2-Dichloropropane	EPA 524.2
1,3-Dichloropropane	EPA 524.2

Serial No.: 66334

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:*

Volatile Halocarbons

2,2-Dichloropropane	EPA 524.2
Bromochloromethane	EPA 524.2
Bromomethane	EPA 524.2
Carbon tetrachloride	EPA 524.2
Chloroethane	EPA 524.2
Chloromethane	EPA 524.2
cis-1,2-Dichloroethene	EPA 524.2
cis-1,3-Dichloropropene	EPA 524.2
Dibromomethane	EPA 524.2
Dichlorodifluoromethane	EPA 524.2
Methylene chloride	EPA 524.2
Tetrachloroethene	EPA 524.2
trans-1,2-Dichloroethene	EPA 524.2
trans-1,3-Dichloropropene	EPA 524.2
Trichloroethene	EPA 524.2
Trichlorofluoromethane	EPA 524.2
Vinyl chloride	EPA 524.2



Serial No.: 66334

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Acrylates

Acrolein (Propenal)	EPA 8260D
	EPA 8260C
	EPA 624.1
Acrylonitrile	EPA 8260D
	EPA 8260C
	EPA 624.1

Amines

1,2-Diphenylhydrazine	EPA 625.1
	EPA 8270D
	EPA 8270E
2-Nitroaniline	EPA 8270D
	EPA 8270E
3-Nitroaniline	EPA 8270D
	EPA 8270E
4-Chloroaniline	EPA 8270D
	EPA 8270E
4-Nitroaniline	EPA 8270D
	EPA 8270E
Aniline	EPA 625.1
	EPA 8270D
	EPA 8270E
Carbazole	EPA 625.1
	EPA 8270D
	EPA 8270E
Pyridine	EPA 625.1
	EPA 8270D
	EPA 8270E

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Bacteriology

Coliform, Fecal	SM 9222D-2015 Colilert-18
Coliform, Total	SM 9222B-2015
E. coli (Enumeration)	m-Colibblue24 Colilert-24 SM 9223B-2016 Colilert-18
Enterococci	SM 9230D-2013 (Enterolert)
Heterotrophic Plate Count	SM 18-21 9215B

Benzidines

3,3'-Dichlorobenzidine	EPA 625.1 EPA 8270D EPA 8270E
Benzidine	EPA 625.1 EPA 8270D EPA 8270E

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 8081B EPA 608.3
4,4'-DDE	EPA 8081B EPA 608.3
4,4'-DDT	EPA 8081B EPA 608.3
Aldrin	EPA 8081B EPA 608.3
alpha-BHC	EPA 8081B

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Chlorinated Hydrocarbon Pesticides

alpha-BHC	EPA 608.3
alpha-Chlordane	EPA 8081B
beta-BHC	EPA 8081B
	EPA 608.3
Chlordane Total	EPA 8081B
	EPA 608.3
delta-BHC	EPA 8081B
	EPA 608.3
Dieldrin	EPA 8081B
	EPA 608.3
Endosulfan I	EPA 8081B
	EPA 608.3
Endosulfan II	EPA 8081B
	EPA 608.3
Endosulfan sulfate	EPA 8081B
	EPA 608.3
Endrin	EPA 8081B
	EPA 608.3
Endrin aldehyde	EPA 8081B
	EPA 608.3
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
	EPA 608.3
Heptachlor epoxide	EPA 8081B
	EPA 608.3
Lindane	EPA 8081B



Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Chlorinated Hydrocarbon Pesticides

Lindane	EPA 608.3
Methoxychlor	EPA 8081B
	EPA 608.3
PCNB	EPA 8270D
	EPA 8270E
Toxaphene	EPA 8081B
	EPA 608.3

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260D
	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D
	EPA 8270E
1,2,4-Trichlorobenzene	EPA 625.1
	EPA 8270D
	EPA 8270E
2-Chloronaphthalene	EPA 625.1
	EPA 8270D
	EPA 8270E
Hexachlorobenzene	EPA 8081B
	EPA 625.1
	EPA 8270D
	EPA 8270E
Hexachlorobutadiene	EPA 625.1
	EPA 8270D
	EPA 8270E
Hexachlorocyclopentadiene	EPA 625.1
	EPA 8270D

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Chlorinated Hydrocarbons

Hexachlorocyclopentadiene	EPA 8270E
Hexachloroethane	EPA 625.1
	EPA 8270D
	EPA 8270E

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dalapon	EPA 8151A
Dicamba	EPA 8151A
Dichloroprop	EPA 8151A
Dinoseb	EPA 8151A
Pentachlorophenol	EPA 8151A

Demand

Biochemical Oxygen Demand	SM 5210B-2016
Carbonaceous BOD	SM 5210B-2016
Chemical Oxygen Demand	SM 5220D-2011

Fuel Oxygenates

Di-isopropyl ether	EPA 8260D
	EPA 8260C
Ethanol	EPA 8260D
	EPA 8260C
	EPA 8015D
Methyl tert-butyl ether	EPA 8260D
	EPA 8260C

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Fuel Oxygenates

Methyl tert-butyl ether	EPA 624.1
tert-amyl alcohol	EPA 8260D EPA 8260C
tert-amyl methyl ether (TAME)	EPA 8260D EPA 8260C
tert-butyl alcohol	EPA 8260D EPA 8260C
tert-butyl ethyl ether (ETBE)	EPA 8260D EPA 8260C

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 625.1 EPA 8270D EPA 8270E
4-Bromophenylphenyl ether	EPA 625.1 EPA 8270D EPA 8270E
4-Chlorophenylphenyl ether	EPA 625.1 EPA 8270D EPA 8270E
Bis(2-chloroethoxy)methane	EPA 625.1 EPA 8270D EPA 8270E
Bis(2-chloroethyl)ether	EPA 625.1 EPA 8270D EPA 8270E



Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Low Level Halocarbons

1,2,3-Trichloropropane, Low Level	EPA 8011
1,2-Dibromo-3-chloropropane, Low Le	EPA 8011
1,2-Dibromoethane, Low Level	EPA 8011

Low Level Polynuclear Aromatics

Acenaphthene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Acenaphthylene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Anthracene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Benzo(a)anthracene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Benzo(a)pyrene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Benzo(b)fluoranthene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Benzo(g,h,i)perylene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Benzo(k)fluoranthene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Chrysene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Dibenzo(a,h)anthracene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Fluoranthene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Fluorene Low Level	EPA 8270D SIM



Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Low Level Polynuclear Aromatics

Fluorene Low Level	EPA 8270E SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Naphthalene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Phenanthrene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Pyrene Low Level	EPA 8270D SIM
	EPA 8270E SIM

Metals I

Barium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Cadmium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 7010
	SM 3113B-2010
	EPA 200.8, Rev. 5.4 (1994)
Calcium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Metals I

Chromium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Copper, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Iron, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Lead, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 7010
	SM 3113B-2010
Magnesium, Total	EPA 200.8, Rev. 5.4 (1994)
	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Metals I

Manganese, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Nickel, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Potassium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Silver, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 7010
	SM 3113B-2010
	EPA 200.8, Rev. 5.4 (1994)
Sodium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Metals I

Strontium, Total
EPA 200.7, Rev. 4.4 (1994)
EPA 6010C
EPA 6010D
EPA 200.8, Rev. 5.4 (1994)

Metals II

Aluminum, Total
EPA 200.7, Rev. 4.4 (1994)
EPA 6010C
EPA 6010D
EPA 6020B
Antimony, Total
EPA 200.8, Rev. 5.4 (1994)
EPA 200.7, Rev. 4.4 (1994)
EPA 6010C
EPA 6010D
EPA 6020B
EPA 7010
SM 3113B-2010

Arsenic, Total
EPA 200.8, Rev. 5.4 (1994)
EPA 200.7, Rev. 4.4 (1994)
EPA 6010C
EPA 6010D
EPA 6020B
EPA 7010
SM 3113B-2010

Beryllium, Total
EPA 200.8, Rev. 5.4 (1994)
EPA 200.7, Rev. 4.4 (1994)
EPA 6010C
EPA 6010D

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Metals II

Beryllium, Total	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Chromium VI	EPA 7196A
	SM 3500-Cr B-2011
Mercury, Total	EPA 245.1, Rev. 3.0 (1994)
	EPA 7470A
Selenium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 7010
	SM 3113B-2010
Vanadium, Total	EPA 200.8, Rev. 5.4 (1994)
	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Zinc, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)

Metals III

Cobalt, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Metals III

Cobalt, Total	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Gold, Total	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Molybdenum, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
Thallium, Total	EPA 200.8, Rev. 5.4 (1994)
	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 7010
	SM 3113B-2010
Tin, Total	EPA 200.9 Rev. 2.2 (1994)
	EPA 200.8, Rev. 5.4 (1994)
	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Titanium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Mineral

Acidity	SM 2310B-2011
Alkalinity	SM 2320B-2011
Calcium Hardness	SM 2340B-2011
Chloride	EPA 300.0, Rev. 2.1 (1993) SM 4500-Cl- E-2011
Hardness, Total	SM 2340B-2011
Sulfate (as SO ₄)	EPA 300.0, Rev. 2.1 (1993) SM 4500-SO ₄ D-2011

Miscellaneous

Boron, Total	EPA 200.7, Rev. 4.4 (1994) EPA 6010C EPA 6010D
Bromide	EPA 300.0, Rev. 2.1 (1993)
Color	SM 2120B-2011
Cyanide, Total	EPA 335.4, Rev. 1.0 (1993) EPA 9012B
Formaldehyde	EPA 8315A
non-Polar Extractable Material (TPH)	EPA 1664A
Oil and Grease Total Recoverable	EPA 1664A EPA 1664B EPA 9070A (Solvent:Hexane)
Organic Carbon, Total	SM 5310B-2014
Phenols	EPA 420.4, Rev. 1.0 (1993)
Specific Conductance	SM 2510B-2011
Sulfide (as S)	SM 4500-S ₂ - D-2011
Surfactant (MBAS)	SM 5540C-2011
Turbidity	SM 2130 B-2011

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 625.1
	EPA 8270D
	EPA 8270E
2,6-Dinitrotoluene	EPA 625.1
	EPA 8270D
	EPA 8270E
Isophorone	EPA 625.1
	EPA 8270D
	EPA 8270E
Nitrobenzene	EPA 625.1
	EPA 8270D
	EPA 8270E

Nitrosoamines

N-Nitrosodimethylamine	EPA 625.1
	EPA 8270D
	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 625.1
	EPA 8270D
	EPA 8270E
N-Nitrosodiphenylamine	EPA 625.1
	EPA 8270D
	EPA 8270E

Nutrient

Ammonia (as N)	EPA 350.1, Rev. 2.0 (1993)
Kjeldahl Nitrogen, Total	EPA 351.1 (Rev. 1978)
Nitrate (as N)	EPA 353.2, Rev. 2.0 (1993)

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Nutrient

Nitrate (as N)	EPA 300.0, Rev. 2.1 (1993)
Nitrate-Nitrite (as N)	EPA 353.2, Rev. 2.0 (1993)
	EPA 300.0, Rev. 2.1 (1993)
Nitrite (as N)	EPA 353.2, Rev. 2.0 (1993)
	EPA 300.0, Rev. 2.1 (1993)
Orthophosphate (as P)	SM 4500-P E-2011
	SM 4500-P F-2011 or G-2011
Phosphorus, Total	EPA 200.7, Rev. 4.4 (1994)
	SM 4500-P E-2011

Organophosphate Pesticides

Atrazine	EPA 8141B
	EPA 8270D
	EPA 8270E
Azinphos methyl	EPA 8141B
Diazinon	EPA 8141B
Disulfoton	EPA 8141B
Malathion	EPA 8141B
Parathion ethyl	EPA 8270D
	EPA 8270E
Simazine	EPA 8141B

Petroleum Hydrocarbons

Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D

Phthalate Esters

Benzyl butyl phthalate	EPA 625.1
	EPA 8270D

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Phthalate Esters

Benzyl butyl phthalate	EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 625.1 EPA 8270D EPA 8270E
Diethyl phthalate	EPA 625.1 EPA 8270D EPA 8270E
Dimethyl phthalate	EPA 625.1 EPA 8270D EPA 8270E
Di-n-butyl phthalate	EPA 625.1 EPA 8270D EPA 8270E
Di-n-octyl phthalate	EPA 625.1 EPA 8270D EPA 8270E

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A EPA 608.3
Aroclor 1221 (PCB-1221)	EPA 8082A EPA 608.3
Aroclor 1232 (PCB-1232)	EPA 8082A EPA 608.3
Aroclor 1242 (PCB-1242)	EPA 8082A EPA 608.3
Aroclor 1248 (PCB-1248)	EPA 8082A EPA 608.3

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Polychlorinated Biphenyls

Aroclor 1254 (PCB-1254)	EPA 8082A
	EPA 608.3
Aroclor 1260 (PCB-1260)	EPA 8082A
	EPA 608.3
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
PCB 101	EPA 8082A
PCB 105	EPA 8082A
PCB 118	EPA 8082A
PCB 128	EPA 8082A
PCB 138	EPA 8082A
PCB 153	EPA 8082A
PCB 170	EPA 8082A
PCB 18	EPA 8082A
PCB 180	EPA 8082A
PCB 183	EPA 8082A
PCB 184	EPA 8082A
PCB 187	EPA 8082A
PCB 195	EPA 8082A
PCB 206	EPA 8082A
PCB 209	EPA 8082A
PCB 28	EPA 8082A
PCB 44	EPA 8082A
PCB 49	EPA 8082A
PCB 52	EPA 8082A
PCB 66	EPA 8082A
PCB 8	EPA 8082A



Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Polychlorinated Biphenyls

PCB 87	EPA 8082A
PCB Congeners, Total	EPA 8082A

Polynuclear Aromatics

Acenaphthene	EPA 625.1
	EPA 8270D
	EPA 8270E
Acenaphthylene	EPA 625.1
	EPA 8270D
	EPA 8270E
Anthracene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(a)anthracene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(a)pyrene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(b)fluoranthene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(g,h,i)perylene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(k)fluoranthene	EPA 625.1
	EPA 8270D
	EPA 8270E

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Polynuclear Aromatics

Chrysene	EPA 625.1
	EPA 8270D
	EPA 8270E
Dibenzo(a,h)anthracene	EPA 625.1
	EPA 8270D
	EPA 8270E
Fluoranthene	EPA 625.1
	EPA 8270D
	EPA 8270E
Fluorene	EPA 625.1
	EPA 8270D
	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 625.1
	EPA 8270D
	EPA 8270E
Naphthalene	EPA 625.1
	EPA 8270D
	EPA 8270E
Phenanthrene	EPA 625.1
	EPA 8270D
	EPA 8270E
Pyrene	EPA 625.1
	EPA 8270D
	EPA 8270E

Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270D
	EPA 8270E

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Priority Pollutant Phenols

2,4,5-Trichlorophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2,4,6-Trichlorophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2,4-Dichlorophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2,4-Dimethylphenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2,4-Dinitrophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2,6-Dichlorophenol	EPA 8270D
	EPA 8270E
	EPA 8270E
2-Chlorophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2-Methylphenol	EPA 625.1
	EPA 8270D
	EPA 8270E
2-Nitrophenol	EPA 625.1
	EPA 625.1
	EPA 625.1

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Priority Pollutant Phenols

2-Nitrophenol	EPA 8270D
	EPA 8270E
3-Methylphenol	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Chloro-3-methylphenol	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Methylphenol	EPA 625.1
	EPA 8270D
	EPA 8270E
4-Nitrophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
Cresols, Total	EPA 625.1
	EPA 8270D
	EPA 8270E
Pentachlorophenol	EPA 625.1
	EPA 8270D
	EPA 8270E
Phenol	EPA 625.1
	EPA 8270D
	EPA 8270E

Residue

Settleable Solids	SM 2540 F-2015
Solids, Total	SM 2540 B-2015
Solids, Total Dissolved	SM 2540 C-2015

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Residue

Solids, Total Suspended	SM 2540 D-2015
Solids, Volatile	SM 2540 E-2015

Semi-Volatile Organics

1,1'-Biphenyl	EPA 8270D
	EPA 8270E
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
2-Methylnaphthalene	EPA 625.1
	EPA 8270D
	EPA 8270E
Acetophenone	EPA 8270D
	EPA 8270E
alpha-Terpineol	EPA 625.1
Benzaldehyde	EPA 8270D
	EPA 8270E
Benzoic Acid	EPA 8270D
	EPA 8270E
Benzyl alcohol	EPA 8270D
	EPA 8270E
Caprolactam	EPA 8270D
	EPA 8270E
Dibenzofuran	EPA 8270D
	EPA 8270E

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	EPA 8260D
	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,2-Dichlorobenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
1,3,5-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,3-Dichlorobenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
1,4-Dichlorobenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
2-Chlorotoluene	EPA 8260D
	EPA 8260C
4-Chlorotoluene	EPA 8260D
	EPA 8260C
Benzene	EPA 8260D
	EPA 8260C
	EPA 624.1
Bromobenzene	EPA 8260D
	EPA 8260C
Chlorobenzene	EPA 8260D
	EPA 8260C
	EPA 624.1

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Volatile Aromatics

Ethyl benzene	EPA 8260D
	EPA 8260C
	EPA 624.1
Isopropylbenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
m/p-Xylenes	EPA 8260D
	EPA 8260C
	EPA 624.1
Naphthalene, Volatile	EPA 8260D
	EPA 8260C
	EPA 624.1
n-Butylbenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
n-Propylbenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
o-Xylene	EPA 8260D
	EPA 8260C
	EPA 624.1
p-Isopropyltoluene (P-Cymene)	EPA 8260D
	EPA 8260C
	EPA 624.1
sec-Butylbenzene	EPA 8260D
	EPA 8260C
	EPA 624.1
Styrene	EPA 8260D
	EPA 8260C
	EPA 624.1
tert-Butylbenzene	EPA 8260D
	EPA 8260C

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Volatile Aromatics

Toluene	EPA 8260D
	EPA 8260C
	EPA 624.1
Total Xylenes	EPA 8260D
	EPA 8260C
	EPA 624.1

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1,1-Trichloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1,2,2-Tetrachloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1,2-Trichloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1-Dichloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
1,1-Dichloroethene	EPA 8260D
	EPA 8260C
	EPA 624.1

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Volatile Halocarbons

1,1-Dichloropropene	EPA 8260D EPA 8260C
1,2,3-Trichloropropane	EPA 8260D EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260D EPA 8260C
1,2-Dibromoethane	EPA 8260D EPA 8260C
1,2-Dichloroethane	EPA 8260D EPA 8260C EPA 624.1
1,2-Dichloropropane	EPA 8260D EPA 8260C EPA 624.1
1,3-Dichloropropane	EPA 8260D EPA 8260C
2,2-Dichloropropane	EPA 8260D EPA 8260C
2-Chloroethylvinyl ether	EPA 8260D EPA 8260C EPA 624.1
Bromochloromethane	EPA 8260D EPA 8260C
Bromodichloromethane	EPA 8260D EPA 8260C EPA 624.1
Bromoform	EPA 8260D

Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Volatile Halocarbons

Bromoform	EPA 8260C
	EPA 624.1
Bromomethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Carbon tetrachloride	EPA 8260D
	EPA 8260C
	EPA 624.1
Chloroethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Chloroform	EPA 8260D
	EPA 8260C
	EPA 624.1
Chloromethane	EPA 8260D
	EPA 8260C
	EPA 624.1
cis-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
	EPA 624.1
cis-1,3-Dichloropropene	EPA 8260D
	EPA 8260C
	EPA 624.1
Dibromochloromethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Dibromomethane	EPA 8260D



Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Volatile Halocarbons

Dibromomethane	EPA 8260C
Dichlorodifluoromethane	EPA 8260D
	EPA 8260C
	EPA 624.1
Hexachlorobutadiene, Volatile	EPA 8260D
	EPA 8260C
Methyl iodide	EPA 8260D
	EPA 8260C
Methylene chloride	EPA 8260D
	EPA 8260C
	EPA 624.1
Tetrachloroethene	EPA 8260D
	EPA 8260C
	EPA 624.1
trans-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
	EPA 624.1
trans-1,3-Dichloropropene	EPA 8260D
	EPA 8260C
	EPA 624.1
trans-1,4-Dichloro-2-butene	EPA 8260D
	EPA 8260C
Trichloroethene	EPA 8260D
	EPA 8260C
	EPA 624.1
Trichlorofluoromethane	EPA 8260D
	EPA 8260C



Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Volatile Halocarbons

Trichlorofluoromethane	EPA 624.1
Vinyl chloride	EPA 8260D
	EPA 8260C
	EPA 624.1

Volatiles Organics

1,4-Dioxane	EPA 8260D
	EPA 8260C
	EPA 8270D
	EPA 8270D SIM
	EPA 8270E
	EPA 8270E SIM
2-Butanone (Methylethyl ketone)	EPA 8260D
	EPA 8260C
2-Hexanone	EPA 8260D
	EPA 8260C
2-Nitropropane	EPA 8260D
	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260D
	EPA 8260C
Acetone	EPA 8260D
	EPA 8260C
	EPA 624.1
Carbon Disulfide	EPA 8260D
	EPA 8260C
Cyclohexane	EPA 8260D
	EPA 8260C
Di-ethyl ether	EPA 8260D



Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:*

Volatiles Organics

Di-ethyl ether	EPA 8260C
Ethylene Glycol	EPA 8015D
Isobutyl alcohol	EPA 8015D
Methyl acetate	EPA 8260D
	EPA 8260C
Methyl cyclohexane	EPA 8260D
	EPA 8260C
Propylene Glycol	EPA 8015D
Vinyl acetate	EPA 8260D
	EPA 8260C

Sample Preparation Methods

SM 4500-P B(5)-2011
EPA 5030C
SM 4500-CN B-2016 and C-2016
EPA 3010A
EPA 3005A
EPA 3510C
EPA 3520C
EPA 3020A
EPA 9010C
SM 4500-S2- B,C-2011



Serial No.: 66335

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Acrylates

Acrolein (Propenal)	EPA 8260D
	EPA 8260C
Acrylonitrile	EPA 8260D
	EPA 8260C

Amines

1,2-Diphenylhydrazine	EPA 8270D
	EPA 8270E
2-Nitroaniline	EPA 8270D
	EPA 8270E
3-Nitroaniline	EPA 8270D
	EPA 8270E
4-Chloroaniline	EPA 8270D
	EPA 8270E
4-Nitroaniline	EPA 8270D
	EPA 8270E
Aniline	EPA 8270D
	EPA 8270E
Carbazole	EPA 8270D
	EPA 8270E

Benzidines

3,3'-Dichlorobenzidine	EPA 8270D
	EPA 8270E
Benzidine	EPA 8270D
	EPA 8270E

Characteristic Testing

Corrosivity (pH)	EPA 9045D
------------------	-----------

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Characteristic Testing

Free Liquids	EPA 9095B
Ignitability	EPA 1010B
	EPA 1010A
Synthetic Precipitation Leaching Proc.	EPA 1312
TCLP	EPA 1311

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B
4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B
alpha-BHC	EPA 8081B
alpha-Chlordane	EPA 8081B
Atrazine	EPA 8270D
	EPA 8270E
beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B
delta-BHC	EPA 8081B
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Chlorinated Hydrocarbon Pesticides

Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Mirex	EPA 8081B
Pentachloronitrobenzene	EPA 8270D
	EPA 8270E
Simazine	EPA 8141B
Toxaphene	EPA 8081B

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260D
	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D
	EPA 8270E
1,2,4-Trichlorobenzene	EPA 8270D
	EPA 8270E
2-Chloronaphthalene	EPA 8270D
	EPA 8270E
Hexachlorobenzene	EPA 8270D
	EPA 8270E
Hexachlorobutadiene	EPA 8270D
	EPA 8270E
Hexachlorocyclopentadiene	EPA 8270D
	EPA 8270E
Hexachloroethane	EPA 8270D
	EPA 8270E

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A
---------	-----------

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Chlorophenoxy Acid Pesticides

2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dalapon	EPA 8151A
Dicamba	EPA 8151A
Dichloroprop	EPA 8151A
Dinoseb	EPA 8151A
MCPA	EPA 8151A
MCPP	EPA 8151A
Pentachlorophenol	EPA 8151A

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 8270D EPA 8270E
4-Bromophenylphenyl ether	EPA 8270D EPA 8270E
4-Chlorophenylphenyl ether	EPA 8270D EPA 8270E
Bis(2-chloroethoxy)methane	EPA 8270D EPA 8270E
Bis(2-chloroethyl)ether	EPA 8270D EPA 8270E

Low Level Polynuclear Aromatic Hydrocarbons

Acenaphthene Low Level	EPA 8270D SIM EPA 8270E SIM
Acenaphthylene Low Level	EPA 8270D SIM EPA 8270E SIM

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Low Level Polynuclear Aromatic Hydrocarbons

Anthracene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Benzo(a)anthracene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Benzo(a)pyrene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Benzo(b)fluoranthene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Benzo(g,h,i)perylene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Benzo(k)fluoranthene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Chrysene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Dibenzo(a,h)anthracene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Fluoranthene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Fluorene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Naphthalene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Phenanthrene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Pyrene Low Level	EPA 8270D SIM

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Low Level Polynuclear Aromatic Hydrocarbons

Pyrene Low Level EPA 8270E SIM

Metals I

Barium, Total EPA 6010C

EPA 6010D

Cadmium, Total EPA 6010C

EPA 6010D

Calcium, Total EPA 6010C

EPA 6010D

Chromium, Total EPA 6010C

EPA 6010D

Copper, Total EPA 6010C

EPA 6010D

Iron, Total EPA 6010C

EPA 6010D

Lead, Total EPA 6010C

EPA 6010D

Magnesium, Total EPA 6010C

EPA 6010D

Manganese, Total EPA 6010C

EPA 6010D

Nickel, Total EPA 6010C

EPA 6010D

Potassium, Total EPA 6010C

EPA 6010D

Silver, Total EPA 6010C

EPA 6010D

Sodium, Total EPA 6010C

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Metals I

Sodium, Total	EPA 6010D
Strontium, Total	EPA 6010C
	EPA 6010D

Metals II

Aluminum, Total	EPA 6010C
	EPA 6010D
Antimony, Total	EPA 6010C
	EPA 6010D
Arsenic, Total	EPA 6010C
	EPA 6010D
Beryllium, Total	EPA 6010C
	EPA 6010D
Chromium VI	EPA 7196A
Mercury, Total	EPA 7471B
Selenium, Total	EPA 6010C
	EPA 6010D
Vanadium, Total	EPA 6010C
	EPA 6010D
Zinc, Total	EPA 6010C
	EPA 6010D

Metals III

Cobalt, Total	EPA 6010C
	EPA 6010D
Molybdenum, Total	EPA 6010C
	EPA 6010D
Thallium, Total	EPA 6010C

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Metals III

Thallium, Total	EPA 6010D
Tin, Total	EPA 6010C
	EPA 6010D
Titanium, Total	EPA 6010C
	EPA 6010D

Minerals

Bromide	EPA 9056A
Chloride	EPA 9056A
Fluoride, Total	EPA 9056A
Sulfate (as SO ₄)	EPA 9056A

Miscellaneous

Boron, Total	EPA 6010C
	EPA 6010D
Cyanide, Total	EPA 9012B
Formaldehyde	EPA 8315A
Organic Carbon, Total	Lloyd Kahn Method
	EPA 9060A
Phenols	EPA 9066
Specific Conductance	EPA 9050A
Sulfide (as S)	EPA 9034

Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 8270D
	EPA 8270E
2,6-Dinitrotoluene	EPA 8270D
	EPA 8270E
Isophorone	EPA 8270D

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Nitroaromatics and Isophorone

Isophorone	EPA 8270E
Nitrobenzene	EPA 8270D
	EPA 8270E
Pyridine	EPA 8270D
	EPA 8270E

Nitrosoamines

N-Nitrosodimethylamine	EPA 8270D
	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 8270D
	EPA 8270E
N-Nitrosodiphenylamine	EPA 8270D
	EPA 8270E

Nutrients

Nitrite (as N)	EPA 9056A
----------------	-----------

Organophosphate Pesticides

Azinphos methyl	EPA 8141B
Diazinon	EPA 8141B
Disulfoton	EPA 8141B
Malathion	EPA 8141B
Parathion ethyl	EPA 8270D
	EPA 8270E

Petroleum Hydrocarbons

Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D
Oil and Grease Total Recoverable	EPA 9071B (Solvent:Hexane)

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Phthalate Esters

Benzyl butyl phthalate	EPA 8270D
	EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 8270D
	EPA 8270E
Diethyl phthalate	EPA 8270D
	EPA 8270E
Dimethyl phthalate	EPA 8270D
	EPA 8270E
Di-n-butyl phthalate	EPA 8270D
	EPA 8270E
Di-n-octyl phthalate	EPA 8270D
	EPA 8270E

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
Aroclor 1016 (PCB-1016) in Oil	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1221 (PCB-1221) in Oil	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1232 (PCB-1232) in Oil	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A
Aroclor 1242 (PCB-1242) in Oil	EPA 8082A
Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1248 (PCB-1248) in Oil	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1254 (PCB-1254) in Oil	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1260 (PCB-1260) in Oil	EPA 8082A

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Polychlorinated Biphenyls

Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1262 (PCB-1262) in Oil	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
Aroclor 1268 (PCB-1268) in Oil	EPA 8082A
PCB 101	EPA 8082A
PCB 105	EPA 8082A
PCB 118	EPA 8082A
PCB 128	EPA 8082A
PCB 138	EPA 8082A
PCB 153	EPA 8082A
PCB 170	EPA 8082A
PCB 18	EPA 8082A
PCB 180	EPA 8082A
PCB 183	EPA 8082A
PCB 184	EPA 8082A
PCB 187	EPA 8082A
PCB 195	EPA 8082A
PCB 206	EPA 8082A
PCB 209	EPA 8082A
PCB 28	EPA 8082A
PCB 44	EPA 8082A
PCB 49	EPA 8082A
PCB 52	EPA 8082A
PCB 66	EPA 8082A
PCB 8	EPA 8082A
PCB 87	EPA 8082A
PCB Congeners, Total	EPA 8082A



Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Polynuclear Aromatic Hydrocarbons

Acenaphthene	EPA 8270D
	EPA 8270E
Acenaphthylene	EPA 8270D
	EPA 8270E
Anthracene	EPA 8270D
	EPA 8270E
Benzo(a)anthracene	EPA 8270D
	EPA 8270E
Benzo(a)pyrene	EPA 8270D
	EPA 8270E
Benzo(b)fluoranthene	EPA 8270D
	EPA 8270E
Benzo(g,h,i)perylene	EPA 8270D
	EPA 8270E
Benzo(k)fluoranthene	EPA 8270D
	EPA 8270E
Chrysene	EPA 8270D
	EPA 8270E
Dibenzo(a,h)anthracene	EPA 8270D
	EPA 8270E
Fluoranthene	EPA 8270D
	EPA 8270E
Fluorene	EPA 8270D
	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 8270D
	EPA 8270E
Naphthalene	EPA 8270D



Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Polynuclear Aromatic Hydrocarbons

Naphthalene	EPA 8270E
Phenanthrene	EPA 8270D
	EPA 8270E
Pyrene	EPA 8270D
	EPA 8270E

Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270D
	EPA 8270E
2,4,5-Trichlorophenol	EPA 8270D
	EPA 8270E
2,4,6-Trichlorophenol	EPA 8270D
	EPA 8270E
2,4-Dichlorophenol	EPA 8270D
	EPA 8270E
2,4-Dimethylphenol	EPA 8270D
	EPA 8270E
2,4-Dinitrophenol	EPA 8270D
	EPA 8270E
2,6-Dichlorophenol	EPA 8270D
	EPA 8270E
2-Chlorophenol	EPA 8270D
	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 8270D
	EPA 8270E
2-Methylphenol	EPA 8270D
	EPA 8270E
2-Nitrophenol	EPA 8270D

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Priority Pollutant Phenols

2-Nitrophenol	EPA 8270E
3-Methylphenol	EPA 8270D
	EPA 8270E
4-Chloro-3-methylphenol	EPA 8270D
	EPA 8270E
4-Methylphenol	EPA 8270D
	EPA 8270E
4-Nitrophenol	EPA 8270D
	EPA 8270E
Pentachlorophenol	EPA 8270D
	EPA 8270E
Phenol	EPA 8270D
	EPA 8270E

Semi-Volatile Organics

1,1'-Biphenyl	EPA 8270D
	EPA 8270E
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
2-Methylnaphthalene	EPA 8270D
	EPA 8270E
Acetophenone	EPA 8270D
	EPA 8270E
Benzaldehyde	EPA 8270D

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Semi-Volatile Organics

Benzaldehyde	EPA 8270E
Benzoic Acid	EPA 8270D
	EPA 8270E
Benzyl alcohol	EPA 8270D
	EPA 8270E
Caprolactam	EPA 8270D
	EPA 8270E
Dibenzofuran	EPA 8270D
	EPA 8270E

Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	EPA 8260D
	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,2-Dichlorobenzene	EPA 8260D
	EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260D
	EPA 8260C
1,3-Dichlorobenzene	EPA 8260D
	EPA 8260C
1,4-Dichlorobenzene	EPA 8260D
	EPA 8260C
2-Chlorotoluene	EPA 8260D
	EPA 8260C
4-Chlorotoluene	EPA 8260D
	EPA 8260C
Benzene	EPA 8260D



Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Volatile Aromatics

Benzene	EPA 8260C
Bromobenzene	EPA 8260D
	EPA 8260C
Chlorobenzene	EPA 8260D
	EPA 8260C
Ethyl benzene	EPA 8260D
	EPA 8260C
Isopropylbenzene	EPA 8260D
	EPA 8260C
m/p-Xylenes	EPA 8260D
	EPA 8260C
Naphthalene, Volatile	EPA 8260D
	EPA 8260C
n-Butylbenzene	EPA 8260D
	EPA 8260C
n-Propylbenzene	EPA 8260D
	EPA 8260C
o-Xylene	EPA 8260D
	EPA 8260C
p-Isopropyltoluene (P-Cymene)	EPA 8260D
	EPA 8260C
sec-Butylbenzene	EPA 8260D
	EPA 8260C
Styrene	EPA 8260D
	EPA 8260C
tert-Butylbenzene	EPA 8260D
	EPA 8260C



Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Volatile Aromatics

Toluene	EPA 8260D EPA 8260C
Total Xylenes	EPA 8260D EPA 8260C

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260D EPA 8260C
1,1,1-Trichloroethane	EPA 8260D EPA 8260C
1,1,2,2-Tetrachloroethane	EPA 8260D EPA 8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D EPA 8260C
1,1,2-Trichloroethane	EPA 8260D EPA 8260C
1,1-Dichloroethane	EPA 8260D EPA 8260C
1,1-Dichloroethene	EPA 8260D EPA 8260C
1,1-Dichloropropene	EPA 8260D EPA 8260C
1,2,3-Trichloropropane	EPA 8260D EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260D EPA 8260C
1,2-Dibromoethane	EPA 8260D EPA 8260C

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Volatile Halocarbons

1,2-Dichloroethane	EPA 8260D
	EPA 8260C
1,2-Dichloropropane	EPA 8260D
	EPA 8260C
1,3-Dichloropropane	EPA 8260D
	EPA 8260C
2,2-Dichloropropane	EPA 8260D
	EPA 8260C
Bromochloromethane	EPA 8260D
	EPA 8260C
Bromodichloromethane	EPA 8260D
	EPA 8260C
Bromoform	EPA 8260D
	EPA 8260C
Bromomethane	EPA 8260D
	EPA 8260C
Carbon tetrachloride	EPA 8260D
	EPA 8260C
Chloroethane	EPA 8260D
	EPA 8260C
Chloroform	EPA 8260D
	EPA 8260C
Chloromethane	EPA 8260D
	EPA 8260C
cis-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
cis-1,3-Dichloropropene	EPA 8260D

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Volatile Halocarbons

cis-1,3-Dichloropropene	EPA 8260C
Dibromochloromethane	EPA 8260D
	EPA 8260C
Dibromomethane	EPA 8260D
	EPA 8260C
Dichlorodifluoromethane	EPA 8260D
	EPA 8260C
Hexachlorobutadiene, Volatile	EPA 8260D
	EPA 8260C
Methylene chloride	EPA 8260D
	EPA 8260C
Tetrachloroethene	EPA 8260D
	EPA 8260C
trans-1,2-Dichloroethene	EPA 8260D
	EPA 8260C
trans-1,3-Dichloropropene	EPA 8260D
	EPA 8260C
trans-1,4-Dichloro-2-butene	EPA 8260D
	EPA 8260C
Trichloroethene	EPA 8260D
	EPA 8260C
Trichlorofluoromethane	EPA 8260D
	EPA 8260C
Vinyl chloride	EPA 8260D
	EPA 8260C

Volatile Organics

1,4-Dioxane	EPA 8260D
-------------	-----------

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Volatile Organics

1,4-Dioxane	EPA 8260C EPA 8270D SIM EPA 8270E SIM
2-Butanone (Methylethyl ketone)	EPA 8260D EPA 8260C
2-Hexanone	EPA 8260D EPA 8260C
2-Nitropropane	EPA 8260D EPA 8260C
4-Methyl-2-Pentanone	EPA 8260D EPA 8260C
Acetone	EPA 8260D EPA 8260C
Carbon Disulfide	EPA 8260D EPA 8260C
Cyclohexane	EPA 8260D EPA 8260C
Di-ethyl ether	EPA 8260D EPA 8260C
Ethylene Glycol	EPA 8260D EPA 8260C EPA 8015D
Isobutyl alcohol	EPA 8015D
Methyl acetate	EPA 8260D EPA 8260C
Methyl cyclohexane	EPA 8260D EPA 8260C



Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Volatile Organics

Methyl tert-butyl ether	EPA 8260D
	EPA 8260C
tert-butyl alcohol	EPA 8260D
	EPA 8260C
Tetrahydrofuran	EPA 8260D
	EPA 8260C
Vinyl acetate	EPA 8260D
	EPA 8260C

Sample Preparation Methods

EPA 5035A-L
EPA 5035A-H
EPA 3580A
EPA 9030B
EPA 3050B
EPA 3550C
EPA 3540C
EPA 3546
EPA 3545A
EPA 3051A
EPA 5021A
EPA 3060A
EPA 9010C

Serial No.: 66336

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Lead in Dust Wipes	EPA 6010C
	EPA 6010D
Lead in Paint	EPA 6010C
	EPA 6010D

Sample Preparation Methods

EPA 3050B
EPA 3051A



Serial No.: 66337

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:*

Acrylates

Acrylonitrile	EPA TO-15
Methyl methacrylate	EPA TO-15

Chlorinated Hydrocarbons

1,2,4-Trichlorobenzene	EPA TO-15
Hexachlorobutadiene	EPA TO-15
Hexachloroethane	EPA TO-15

Metals I

Lead, Total	EPA 29 (6010)
	EPA 7010

Polychlorinated Biphenyls

PCBs and Aroclors	EPA TO-10A
-------------------	------------

Polynuclear Aromatics

Naphthalene	EPA TO-15
-------------	-----------

Purgeable Aromatics

1,2,4-Trimethylbenzene	EPA TO-15
1,2-Dichlorobenzene	EPA TO-15
1,3,5-Trimethylbenzene	EPA TO-15
1,3-Dichlorobenzene	EPA TO-15
1,4-Dichlorobenzene	EPA TO-15
2-Chlorotoluene	EPA TO-15
Benzene	EPA TO-15
Chlorobenzene	EPA TO-15
Ethyl benzene	EPA TO-15
Isopropylbenzene	EPA TO-15
m/p-Xylenes	EPA TO-15

Serial No.: 66338

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:*

Purgeable Aromatics

o-Xylene	EPA TO-15
Styrene	EPA TO-15
Toluene	EPA TO-15
Total Xylenes	EPA TO-15

Purgeable Halocarbons

1,1,1-Trichloroethane	EPA TO-15
1,1,2,2-Tetrachloroethane	EPA TO-15
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA TO-15
1,1,2-Trichloroethane	EPA TO-15
1,1-Dichloroethane	EPA TO-15
1,1-Dichloroethene	EPA TO-15
1,2-Dibromo-3-chloropropane	EPA TO-15
1,2-Dibromoethane	EPA TO-15
1,2-Dichloroethane	EPA TO-15
1,2-Dichloropropane	EPA TO-15
3-Chloropropene (Allyl chloride)	EPA TO-15
Bromodichloromethane	EPA TO-15
Bromoform	EPA TO-15
Bromomethane	EPA TO-15
Carbon tetrachloride	EPA TO-15
Chloroethane	EPA TO-15
Chloroform	EPA TO-15
Chloromethane	EPA TO-15
cis-1,2-Dichloroethene	EPA TO-15
cis-1,3-Dichloropropene	EPA TO-15
Dibromochloromethane	EPA TO-15
Dichlorodifluoromethane	EPA TO-15

Serial No.: 66338

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2016) for the category
ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:*

Purgeable Halocarbons

Methylene chloride	EPA TO-15
Tetrachloroethene	EPA TO-15
trans-1,2-Dichloroethene	EPA TO-15
trans-1,3-Dichloropropene	EPA TO-15
Trichloroethene	EPA TO-15
Trichlorofluoromethane	EPA TO-15
Vinyl bromide	EPA TO-15
Vinyl chloride	EPA TO-15

Volatile Chlorinated Organics

Benzyl chloride	EPA TO-15
-----------------	-----------

Volatile Organics

1,2-Dichlorotetrafluoroethane	EPA TO-15
1,3-Butadiene	EPA TO-15
1,4-Dioxane	EPA TO-15
2,2,4-Trimethylpentane	EPA TO-15
2-Butanone (Methylethyl ketone)	EPA TO-15
4-Methyl-2-Pentanone	EPA TO-15
Acetone	EPA TO-15
Carbon Disulfide	EPA TO-15
Cyclohexane	EPA TO-15
Hexane	EPA TO-15
Isopropanol	EPA TO-15
Methyl tert-butyl ether	EPA TO-15
n-Heptane	EPA TO-15
tert-butyl alcohol	EPA TO-15



Serial No.: 66338

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at <https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/>, by phone (518) 485-5570 or by email to elap@health.ny.gov.



Appendix E

Site Cleanup Objectives

Full List of SCOs

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground- water	Unrestricted Use
		Residential	Restricted-Residential	Commercial	Industrial			
METALS								
Arsenic	7440-38 -2	16f	16f		16f	13f	16f	13 ⁺
Barium	7440-39 -3	350f	400	400	10,000 d	433	820	350 ⁺
Beryllium	7440-41 -7	14	72	590	2,700	10	47	7.2
Cadmium	7440-43 -9	2.5f	4.3	9.3	60	4	7.5	2.5 ⁺
Chromium, hexavalent ^h	18540-29-9	22	110	400	800	1e	19	^{1b}
Chromium, trivalent ^h	16065-83-1	36	180	1,500	6,800	41	NS	30 ⁺
Copper	7440-50 -8	270	270	270	10,000 d	50	1,720	50
Total Cyanide ^h		27	27	27	10,000 d	NS	40	27
Lead	7439-92 -1	400	400	1,000	3,900	63f	450	63 ⁺
Manganese	7439-96 -5	2,000f	2,000f	10,000 d	10,000 d	1600f	2,000f	1600 ⁺
Total Mercury		0.81j	0.81j	2.8j	5.7j	0.18f	0.73	0.18 ⁺
Nickel	7440-02 -0	140	310	310	10,000 d	30	130	30
Selenium	7782-49 -2	36	180	1,500	6,800	3.9f	4f	3.9
Silver	7440-22 -4	36	180	1,500	6,800	2	8.3	2
Zinc	7440-66 -6	2200	10,000 d	10,000 d	10,000 d	109f	2,480	109 ⁺
PESTICIDES / PCBs								
2,4,5-TP Acid (Silvex)	93-72-1	58	100a	500b	1,000c	NS	3.8	3.8
4,4'-DDE	72-55-9	1.8	8.9	62	120	0.0033 e	17	0.0033 ⁺
4,4'-DDT	50-29-3	1.7	7.9	47	94	0.0033 e	136	0.0033 ⁺
4,4'-DDD	72-54-8	2.6	13	92	180	0.0033 e	14	0.0033 ⁺
Aldrin	309-00-2	0.019	0.097	0.68	1.4	0.14	0.19	0.005 ⁺
alpha-BHC	319-84-6	0.097	0.48	3.4	6.8	0.04g	0.02	0.02
beta-BHC	319-85-7	0.072	0.36	3	14	0.6	0.09	0.036
Chlordane (alpha)	5103-71 -9	0.91	4.2	24	47	1.3	2.9	0.094
delta-BHC	319-86-8	100a	100a	500b	1,000c	0.04g	0.25	0.04
Dibenzofuran	132-64-9	14	59	350	1,000c	NS	210	7
Dieldrin	60-57-1	0.039	0.2	1.4	2.8	0.006	0.1	0.005 ⁺
Endosulfan I	959-98-8	4.8i	24i	200i	920i	NS	102	2.4
Endosulfan II	33213-65-9	4.8i	24i	200i	920i	NS	102	2.4
Endosulfan sulfate	1031-07 -8	4.8i	24i	200i	920i	NS	1,000c	2.4
Endrin	72-20-8	2.2	11	89	410	0.014	0.06	0.014
Heptachlor	76-44-8	0.42	2.1	15	29	0.14	0.38	0.042
Lindane	58-89-9	0.28	1.3	9.2	23	6	0.1	0.1
Polychlorinated biphenyls	1336-36 -3	1	1	1	25	1	3.2	0.1
SEMI-VOLATILES								
Acenaphthene	83-32-9	100a	100a	500b	1,000c	20	98	20
Acenaphthylene	208-96-8	100a	100a	500b	1,000c	NS	107	100 ⁺
Anthracene	120-12-7	100a	100a	500b	1,000c	NS	1,000c	100 ⁺
Benzo(a)anthracene	56-55-3	1f	1f	5.6	11	NS	1f	^{1c}
Benzo(a)pyrene	50-32-8	1f	1f	1f	1.1	2.6	22	^{1c}
Benzo(b) fluoranthene	205-99-2	1f	1f	5.6	11	NS	1.7	^{1c}
Benzo(g,h,i) perylene	191-24-2	100a	100a	500b	1,000c	NS	1,000c	100
Benzo(k) fluoranthene	207-08-9	1	3.9	56	110	NS	1.7	0.8 ⁺
Chrysene	218-01-9	1f	3.9	56	110	NS	1f	^{1c}
Dibenz(a,h) anthracene	53-70-3	0.33e	0.33e	0.56	1.1	NS	1,000c	0.33 ⁺
Fluoranthene	206-44-0	100a	100a	500b	1,000c	NS	1,000c	100 ⁺
Fluorene	86-73-7	100a	100a	500b	1,000c	30	386	30
Indeno(1,2,3-cd) pyrene	193-39-5	0.5f	0.5f	5.6	11	NS	8.2	0.5 ⁺
m-Cresol	108-39-4	100a	100a	500b	1,000c	NS	0.33e	0.33 ⁺
Naphthalene	91-20-3	100a	100a	500b	1,000c	NS	12	12
o-Cresol	95-48-7	100a	100a	500b	1,000c	NS	0.33e	0.33 ⁺
p-Cresol	106-44-5	34	100a	500b	1,000c	NS	0.33e	0.33 ⁺
Pentachlorophenol	87-86-5	2.4	6.7	6.7	55	0.8e	0.8e	0.8 ⁺
Phenanthrene	85-01-8	100a	100a	500b	1,000c	NS	1,000c	100
Phenol	108-95-2	100a	100a	500b	1,000c	30	0.33e	0.33 ⁺
Pyrene	129-00-0	100a	100a	500b	1,000c	NS	1,000c	100
Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground- water	Unrestricted Use
		Residential	Restricted-Residential	Commercial	Industrial			
VOLATILES								
1,1,1-Trichloroethane	71-55-6	100a	100a	500b	1,000c	NS	0.68	0.68
1,1-Dichloroethane	75-34-3	19	26	240	480	NS	0.27	0.27
1,1-Dichloroethene	75-35-4	100a	100a	500b	1,000c	NS	0.33	0.33
1,2-Dichlorobenzene	95-50-1	100a	100a	500b	1,000c	NS	1.1	1.1
1,2-Dichloroethane	107-06-2	2.3	3.1	30	60	10	0.02f	0.02 ⁺
cis-1,2-Dichloroethene	156-59-2	59	100a	500b	1,000c	NS	0.25	0.25
trans-1,2-Dichloroethene	156-60-5	100a	100a	500b	1,000c	NS	0.19	0.19
1,3-Dichlorobenzene	541-73-1	17	49	280	560	NS	2.4	2.4
1,4-Dichlorobenzene	106-46-7	9.8	13	130	250	20	1.8	1.8
1,4-Dioxane	123-91-1	9.8	13	130	250	0.1e	0.1e	0.1 ⁺
Acetone	67-64-1	100a	100b	500b	1,000c	2.2	0.05	0.05
Benzene	71-43-2	2.9	4.8	44	89	70	0.06	0.06

Full List of SCOs

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground- water	Unrestricted Use
		Residential	Restricted-Residential	Commercial	Industrial			
Butylbenzene	104-51-8	100a	100a	500b	1,000c	NS	12	12
Carbon tetrachloride	56-23-5	1.4	2.4	22	44	NS	0.76	0.76
Chlorobenzene	108-90-7	100a	100a	500b	1,000c	40	1.1	1.1
Chloroform	67-66-3	10	49	350	700	12	0.37	0.37
Ethylbenzene	100-41-4	30	41	390	780	NS	1	1
Hexachlorobenzene	118-74-1	0.33e	1.2	6	12	NS	3.2	0.33 ^a
Methyl ethyl ketone	78-93-3	100a	100a	500b	1,000c	100a	0.12	0.12
Methyl tert-butyl ether	1634-04 -4	62	100a	500b	1,000c	NS	0.93	0.93
Methylene chloride	75-09-2	51	100a	500b	1,000c	12	0.05	0.05
n-Propylbenzene	103-65-1	100a	100a	500b	1,000c	NS	3.9	3.9
sec-Butylbenzene	135-98-8	100a	100a	500b	1,000c	NS	11	11
tert-Butylbenzene	98-06-6	100a	100a	500b	1,000c	NS	5.9	5.9
Tetrachloroethene	127-18-4	5.5	19	150	300	2	1.3	1.3
Toluene	108-88-3	100a	100a	500b	1,000c	36	0.7	0.7
Trichloroethene	79-01-6	10	21	200	400	2	0.47	0.47
1,2,4-Trimethylbenzene	95-63-6	47	52	190	380	NS	3.6	3.6
1,3,5-Trimethylbenzene	108-67-8	47	52	190	380	NS	8.4	8.4
Vinyl chloride	75-01-4	0.21	0.9	13	27	NS	0.02	0.02
Xylene (mixed)	1330-20 -7	100a	100a	500b	1,000c	0.26	1.6	0.26

All soil cleanup objectives (SCOs) are in parts per million (ppm). NS=Not specified. See Technical Support Document (TSD). Footnotes

a The SCOs for residential, restricted-residential and ecological resources use were capped at a maximum value of 100 ppm. See TSD section 9.3.

b The SCOs for commercial use were capped at a maximum value of 500 ppm. See TSD section 9.3.

c The SCOs for industrial use and the protection of groundwater were capped at a maximum value of 1000 ppm. See TSD section 9.3.

d The SCOs for metals were capped at a maximum value of 10,000 ppm. See TSD section 9.3.

e For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the SCO value.

Appendix F

Construction Health and Safety Plan (CHASP)



SITE-SPECIFIC CONSTRUCTION HEALTH AND SAFETY PLAN

for

**1665 Stillwell Avenue,
Brooklyn, NY 11223
NYSDEC Site No. C224307**

Prepared for:

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway,
Albany, NY 12233

Prepared by:

Tyll Engineering and Consulting, PC
169 Commack Road, Suite 173
Commack, NY 11725

February 2024



TYLL ENGINEERING & CONSULTING PC



TYLL ENGINEERING & CONSULTING PC

SITE-SPECIFIC CONSTRUCTION HEALTH AND SAFETY PLAN

Client: **Refulgence LLC**

Site Name: **1665 Stillwell Avenue, Brooklyn, NY**

Site Address: **1665 Stillwell Avenue, Brooklyn, NY 11223 (“Site”)**

Site Number: **C224307**

Date Prepared: **February 16, 2024**

Project Description: **Environmental Remediation**

TYLL ENGINEERING AND CONSULTING, RSK ENVIRONMENTAL, AND ITS SUBCONTRACTORS DO NOT GUARANTEE THE HEALTH OR SAFETY OF ANY PERSON ENTERING THIS SITE. DUE TO THE NATURE OF THIS SITE AND THE ACTIVITY OCCURRING THEREON, IT IS NOT POSSIBLE TO DISCOVER, EVALUATE, AND PROVIDE PROTECTION FOR ALL POSSIBLE HAZARDS WHICH MAY BE ENCOUNTERED. STRICT ADHERENCE TO THIS HEALTH AND SAFETY GUIDELINES SET FORTH HEREIN WILL HELP REDUCE, BUT NOT ELIMINATE, THE POTENTIAL FOR ANY INJURY AT THIS SITE. THE HEALTH AND SAFETY GUIDELINES IN THIS PLAN WERE PREPARED SPECIFICALLY FOR THIS SITE AND SHOULD NOT BE USED ON ANY OTHER SITE(S) WITHOUT PRIOR RESEARCH AND EVALUATION.

**CONSTRUCTION HEALTH AND SAFETY PLAN****Table of Contents**

STATEMENT OF COMMITMENT	SC-1
1.0 INTRODUCTION AND SITE ENTRY REQUIREMENTS	06
1.1 Scope	06
1.2 Application	06
1.3 Site Safety Plan Acceptance, Acknowledgment and Amendments	08
1.4 Key Personnel – Roles and Responsibilities	08
2.0 SITE BACKGROUND AND SCOPE OF WORK	10
3.0 HAZARD ASSESSMENT	12
3.1 Physical Hazards	12
3.1.1 Tripping Hazards	12
3.1.2 Climbing Hazards	12
3.1.3 Cuts and Lacerations	12
3.1.4 Lifting Hazards	12
3.1.5 Utility Hazards	12
3.1.6 Traffic Hazards	12
3.2 Work in Extreme Temperatures	13
3.2.1 Heat Stress	13
3.2.2 Cold Exposure	13
3.3 Chemical Hazards	14
3.3.1 Respirable Dust	14
3.3.2 Dust Control and Monitoring during Earthwork	14
3.3.3 Organic Vapors	14
4.0 PERSONAL PROTECTIVE EQUIPMENT	15
4.1 Level D	15
4.2 Level C	15
4.3 Activity-Specific Levels of Personal Protection	16
5.0 AIR MONITORING AND ACTION LEVELS	17
5.1 Air Monitoring Requirements	17
5.2 Work Stoppage Responses	17
5.3 Action Levels During Site Activities	17
5.4 Community Air Monitoring Plan	18
6.0 SITE CONTROL	21
6.1 Work Zones	21
7.0 CONTINGENCY PLAN/EMERGENCY RESPONSE PLAN	22
7.1 Emergency Equipment On-site	22
7.2 Emergency Telephone Numbers	22
7.3 Personnel Responsibilities During an Emergency	22
7.4 Medical Emergencies	23
7.5 Fire or Explosion	23
7.6 Evacuation Routes	23
7.7 Spill Control Procedures	23
7.8 Vapor Release Plan	24



Table of Contents (Continued)

FIGURES

Figure 1 Route to Hospital (Appendix F)

APPENDICES

APPENDIX A SITE SAFETY ACKNOWLEDGMENT FORM

APPENDIX B COVID-19 DISCOURSE FORM

APPENDIX C SITE SAFETY PLAN AMENDMENTS

APPENDIX D PROPOSED STRUCTURAL PLANS

APPENDIX E CHEMICAL HAZARDS

APPENDIX F HOSPITAL INFORMATION, MAP AND FIELD ACCIDENT REPORT

APPENDIX G FIELD ACCIDENT REPORT



STATEMENT OF COMMITMENT

This Site-Specific Construction Health and Safety Plan (CHASP) has been prepared to ensure that workers are not exposed to risks from hazardous materials during any investigative activities planned specifically for the site located at **1665 Stillwell Avenue, Brooklyn, NY 11223** (the Site). This CHASP, which applies to persons present at the Site actually or potentially exposed to hazardous materials, describes emergency response procedures for actual and potential chemical hazards. This CHASP is also intended to inform and guide personnel entering the work area or exclusion zone. Persons are to acknowledge that they understand the potential hazards and the contents of this Health and Safety policy by signing off on receipt of their individual copy of the document. The subcontractors are retained as independent contractors and are responsible for ensuring the health and safety of their own employees. The subcontractor has the option of adopting this CHASP or providing its own for the planned scope of work.



1.1 INTRODUCTION

The Purpose and Policy of this Site-Specific Construction Health and Safety Plan (HASP) has been developed to comply with the regulations under 26 CFR 1926, Construction, Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER), and COVID-19 Control and Prevention. It addresses safety and health hazards related to subsurface sample collection activities and is based on the best information available with the site work activities to be conducted at 1665 Stillwell Avenue, Brooklyn, NY 11223 (the Site). This document describes the health and safety guidelines developed by Karen Tyll, P.E., for the implementation of a Remedial Investigation Work Plan (RIWP) for the Site, to protect on-site personnel, visitors, and the public from physical harm and exposure to hazardous materials or wastes during the subsurface investigation activities. The CHASP may be revised by Karen Tyll, P.E., at the request of the New City Office of Environmental Remediation (NYCDEP) upon receipt of new information regarding site conditions. Changes will be documented by written amendments signed by RSK's Sr. Project Manager, Site Safety Officer and/or the RSK Health and Safety Consultant.

1.1 Scope

This CHASP addresses the potential hazards related to the Site and lists the proposed remedial action that is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants and uses standard methods that are well established in the industry:

1. Performance of a Special Community Air Monitoring Program (CAMP) for particulates and volatile organic carbon compounds to fulfil the special requirements for work within 20 feet of potentially exposed individuals and structures and special requirements for indoor work with co-located residences or facilities.
2. Establishment of applicable NYSDEC Track 4 Restricted Residential Soil Cleanup Objectives (RRSCOs) and protection of groundwater (PGW) standards.
3. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
4. Utilizing Waste Characterization Study for soils generated during site redevelopment excavation activities for disposal purposes. The waste characterization soil samples were collected at a frequency dictated by the disposal facility.
5. Excavation and removal of soil/fill exceeding Track 4 RRSCOs and PGW standards. For remediation purposes, the top 2-feet of Sitewide soil/fill will be excavated to meet the Restricted Residential SCOs. Approximately 592-cu. Yds. (888-tons) of soil/fill will be generated during remediation excavation.
6. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.
7. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials.
8. Removal of all UST's that are encountered during soil/fill removal actions. Registration of tanks and reporting of any petroleum spills associated with UST's and appropriate closure of these petroleum spills in compliance with applicable local, State and Federal laws and regulations.
9. Transportation and off-Site disposal of all soil/fill material at licensed or permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media on-Site.
10. Collection and analysis of eight (8) end-point samples to determine the performance of the remedy with respect to attainment of Track 4 RRSCOs. In the event the soil samples exceed RRSCOs and PGW SCOs,



- further excavation will take place, and five (5) post-excavation confirmatory samples will be collected post excavation to meet RRSCOs and PGW standards.
11. Import of materials to be used for backfilling and cover in compliance with this plan and in accordance with applicable laws and regulations.
 12. As a part of the development, construction of a composite cover will consist of a 4-inch-thick concrete building cellar slab underlain with a 20-mil vapor barrier (Raven VBP-20) followed by 6-inches layer of $\frac{3}{4}$ -inch crushed blue stone, and a 4-inch-thick concrete slab underlain with a 20-mil vapor barrier (Raven VBP-20), 6-inches layer of $\frac{3}{4}$ -inch crushed blue stone, and 2-feet of imported certified clean fill beneath the remainder of the lot (driveway and rear yard). The elevator pit will be constructed with a 2-foot mat slab and underlain with a 20-mil vapor barrier (Raven VBP-20). The composite cover will be constructed under the supervision of the project's Registered Architect.
 13. As a part of the development, installation of a 20-mil (or better) vapor barrier will be completed beneath the building cellar slab, footings and outside of sub-grade foundation sidewalls to mitigate soil vapor migration into the building. The vapor barrier will consist of a 20-mil Raven Industries Vapor Block Plus (VBP-20) below the slabs within the full building area. All welds, seams and penetrations will be properly sealed to prevent preferential pathways for vapor migration, and installed per the manufacturer's specifications. The remedial engineer will oversee and certify in the FER that the vapor barrier was designed and properly installed within the new building footprint.
 14. Installation of an active sub-slab de-pressurization system (SSDS) consisting of a single loop of horizontal pipe set in the middle of a gas permeable layer immediately beneath the building cellar slab and vapor barrier system. The SSDS gas permeable layer will consist of a 6-inch layer of $\frac{3}{4}$ -inch crushed blue stone placed directly beneath the building cellar slab. The horizontal piping will consist of looped 4-inch slotted HDPE corrugated pipe which will be fabric wrapped, manifolded to a schedule-40 6-inch solid Schedule-40 PVC riser pipe that will penetrate the most northeastern section of the foundation wall and travels along the building rear exterior wall to the first-floor roof. The pipe will be fitted with an inline vacuum fan and finished 3-feet above the top of the parapet line on the first-floor roof with a Schedule-40 PVC 6-inch goose neck pipe to prevent rain infiltration. The Active SSDS is an Engineering Control for the remedial action that will be installed under the supervision of the remedial engineer. The remedial engineer will certify in the FER that the SSDS was designed and properly installed to establish a vacuum in the gas permeable layer and a negative (decreasing outward) pressure gradient across the entire building slab to prevent vapor migration into the building.
 15. Installation of an active Soil Vapor Extraction (SVE) system within a vapor hotspot area (SV-1 & SV-2 from RI, and SV-5 from the Phase-II) as identified in the previous RI on the northeastern corner of the Site (proposed rear yard) in order to remediate chlorinated and petroleum-related VOCs. The system will be constructed with a 4-inch slotted (0.050" slot size) PVC SVE well fabric wrapped installed vertically at a termination depth of 12-feet bgs with a porous annulus not to exceed 8-inches diameter. The SVE annulus will be filled with $\frac{3}{4}$ -inch crushed blue stone to surround the slotted piping and will be connected to a horizontal 4-inch solid PVC pipe which will run beneath site grade and perpendicular toward the rear of the building's most northeastern section and travel along the building rear exterior wall to the first-floor roof. The pipe will be fitted with an inline vacuum fan and finished 3-feet above the top of the parapet line on the first-floor roof with a Schedule-40 PVC 6-inch goose neck pipe to prevent rain infiltration. The Active SVE is Engineering Control for the remedial action that will be installed under the supervision of the remedial engineer. The remedial engineer will certify in the FER that the SVE was designed and properly installed to establish a vacuum in the vapor hotspot area.
 16. Performance of all activities required for the remedial action, including acquisition of required permits and attainment of pretreatment requirements, in compliance with applicable laws and regulations.



17. Dewatering is anticipated during the proposed elevator shaft excavation, and will be done in compliance with city, state, and federal laws and regulations. Extracted groundwater will either be containerized for off-site licensed or permitted disposal or will be treated under the Long Island Well permit from New York City Department of Environmental Protection (NYCDEP) to meet pretreatment requirements prior to discharge to the sewer system.
18. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
19. Submission of an approved Site Management Plan (SMP) in the Final Engineering Report (FER) for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.
20. Submission of an FER that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.
21. Establishment of Engineering Controls in this RAWP and a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without NYSDEC-approval.

1.2 Application

This HASP applies to all personnel involved in the above tasks who wish to gain access into the active work areas of the Site, including but not limited to:

- RSK employees and subcontractors;
- Client representatives; and
- Federal, state or local representatives.

1.3 Site Safety Plan Acceptance, Acknowledgment and Amendments

The site safety officer is responsible for informing personnel (RSK employees and/or owner or owner's representatives) entering the work area of the contents of this plan and ensuring that each person signs the safety plan acknowledging the on-site hazards and procedures required to minimize exposure to adverse effects of these hazards. A copy of the Acknowledgement Form is included in **Appendix A**.

Site conditions may warrant an amendment to this HASP. Amendments to this HASP are acknowledged by completing forms included in **Appendix B**.

1.4 Key Personnel - Roles and Responsibilities

Personnel responsible for implementing this Construction Health and Safety Plan are:

Name	Company/Title	Address	Contact Numbers
Drumita Dmello	RSK Environmental Site Safety Officer	132-02 89 th Avenue Ste. #222 Richmond Hill, NY 11418	(718) 438-2200, Ext. 205 (646) 249-6129
Dhanraj Singh	RSK Environmental Sr. Project Manager	132-02 89 th Avenue Ste. #222 Richmond Hill, NY 11418	(718) 438-2200, Ext. 202 (347) 728-0768



TYLL ENGINEERING & CONSULTING PC

Chandrashekar Singh	RSK Environmental Field Scientist	132-02 89 th Avenue Ste. #222 Richmond Hill, NY 11418	(718) 438-2200 (347) 304-1514
Karen Tyll, P.E.	Tyll Engineering & Consulting PC.	169 Commack Road, Suite 173, Commack, NY 11725	(631)664-6477

The project manager is responsible for overall project administration and, with guidance from the site safety officer, for supervising the implementation of this HASP. The site safety officer will conduct daily (tail gate or toolbox) safety meetings at the project site and oversee daily safety issues. Each subcontractor and supplier (defined as an OSHA employer) is also responsible for the health and safety of its employees. If there is any dispute about health and safety or project activities, on-site personnel will attempt to resolve the issue. If the issue cannot be resolved at the site, then the project manager will be consulted.

The site safety officer is also responsible for coordinating health and safety activities related to hazardous material exposure on-site. The site safety officer is responsible for the following:

1. Educating personnel about information in this HASP and other safety requirements to be observed during site operations, including, but not limited to, decontamination procedures, designation of work zones and levels of protection, air monitoring, fit testing, and emergency procedures dealing with fire and first aid.
2. Coordinating site safety decisions with the project manager.
3. Designating exclusion, decontamination and support zones on a daily basis.
4. Monitoring the condition and status of known on-site hazards and maintaining and implementing the air quality monitoring program specified in this HASP.
5. Maintaining the work zone entry/exit log and site entry/exit log.
6. Maintaining records of safety problems, corrective measures and documentation of chemical exposures or physical injuries (the site safety officer will document these conditions in a bound notebook and maintain a copy of the notebook on-site). The person who observes safety concerns and potential hazards that have not been addressed in the daily safety meetings should immediately report their observations/concerns to the site safety officer or appropriate key personnel.



2.0 SITE BACKGROUND AND SCOPE OF WORK

The Site is located at 1665 Stillwell Avenue, Brooklyn, NY 11223 (identified in Block: 6618 & Lot: 48). The Site consists of a rectangular-shaped parcel with a lot area of approximately 8,000-sq.ft. in size. The lot is identified as vacant and pending demolition of existing building for site redevelopment. The lot is located east of Stillwell Avenue, south of Kings Highway, west of W 13th Street, and north of Quentin Road in Brooklyn, Kings County, NY.

2.1 Prior Investigations

A Phase I Environmental Site Assessment was performed by American Environmental Assessment & Solutions Inc. (AEAS) of Brooklyn, New York, dated May 9, 2019, in general accordance with ASTM E1527-13 in order to identify recognized environmental conditions (RECs) associated with the site. The Phase I identified the following RECs for the site:

- The site was assigned an E-Designation for “Hazardous Materials” (E-145) by New York City Department of City Planning (NYCDCP) as part of the July 27, 2005, Bensonhurst Rezoning (CEQR 05DCP055K). Due to this “e” designation, a subsurface investigation was required before development could proceed and satisfaction from NYC Office of Environmental Remediation (OER) will be required before occupancy is permitted.
- Historical use of the site for dry cleaning activities from 1999 through 2014.
- Review of Historical Sanborn Fire Insurance maps indicated the site adjacent to the north (1663 Stillwell Avenue/126-136 Kings Highway) was occupied by an auto repair and gasoline station. Four underground storage tanks (USTs) were identified on the maps dated 1930 through 1981. The site was identified on the NY AST and NY E-designation databases. Historical site usage and the presence of USTs on-site may have impacted 1665 Stillwell Avenue and was identified as a concern.

AEAS recommended a subsurface investigation in the Phase I ESA due to the site’s historic use as a drycleaner and the E-designation assigned by NYCDCP.

AEAS also performed subsurface investigation activities during June and July 2019 for the site by American Environmental Assessment & Solutions, Inc. (AEAS) of Brooklyn, New York. This investigation included soil, groundwater and soil vapor sampling and a geophysical survey.

VOCs were detected in all six soil vapor samples collected during the preliminary subsurface investigation performed by AEAS. Chlorinated solvents (tetrachloroethene and trichloroethene) were detected in the soil vapor samples in elevated levels throughout the site, particularly in the northeast corner of the site adjacent to the shed where dry cleaning chemicals associated with previous site use were stored.

Findings of the preliminary investigation indicated one soil sample location contained the metal lead in a concentration exceeding NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs) and Residential Soil Cleanup Objectives (RSCOs). A number of additional metals were detected in the samples in concentrations falling below UUSCOs. There were no VOCs, SVOCs, Pesticides or PCBs detected in soil sample in concentrations exceeding UUSCOs.

Two groundwater monitoring wells sampled during the preliminary investigation contained VOCs and SVOCs in concentrations exceeding Ambient Water Quality Standards and Guidance Values for groundwater as published in NYSDEC TOGS 1.1.1. Compounds detected exceeding NYSDEC criteria included: 2-Isopropyltoluene,



Isopropylbenzene, Propylbenzene, sec-butylbenzene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene and Indeno(1,2,3-cd) pyrene.

The owner will implement engineering and institutional controls during site remediation and redevelopment activities in order to limit worker and public exposure to contaminated materials in subsurface material on-site.

2.2 Redevelopment Plans

The proposed future use of the Site will consist of a new five-story (15,912.60-sq.ft.) mixed-use building with a commercial space in the cellar and 1st floor, and sixteen (16) residential units 2nd floor through 5th floor. The proposed FAR for commercial is 0.428 and for residential it is 1.561 with a max. building height of 59-feet 8-inch. The layout will consist of no front yard, a 38-feet paved rear yard to be utilized for off-street parking and a 14-feet 10-inch side yard to be utilized as a paved driveway. The proposed cellar depth (top of slab) for the new building will be 10-feet below site grade (bsg). No uncapped areas or landscaping are proposed as part of this redevelopment. The proposed cellar will have a 3,057sq.ft. commercial space with an occupancy of thirty-one (31) persons and the remainder will be utilized as bicycle parking, two (2) utility rooms, a mechanical room, an elevator access and two (2) toilets. The proposed 1st floor will have a commercial space 3,499-sq. ft. in size with an occupancy of thirty-five (35) persons, lobby, a mechanical room, an elevator access and two (2) toilets. Each floor will consist of four (4) residential units that will have two bedrooms, a bathroom, living area, and a kitchenette. Two (2) terrace spaces are proposed for the residential units on the 5th floor. The proposed building will be serviced by an elevator on all floors. The proposed elevator shaft will be 17.5-feet bsg. The roof bulkhead will consist of a rooftop recreation space 616.5-sq. ft. in size, elevator control room and will house the hot water heaters, vents, and exhausts.

The eastern portion of the site will be a paved parking area with eight parking spaces. A driveway will be constructed on the southern portion of the site, providing access to the rear yard. The architectural plans for the proposed building are attached as **Appendix C**.



3.0 HAZARD ASSESSMENT

This section identifies the hazards associated with the proposed scope of work, general physical hazards that can be expected at most sites; and presents a summary of documented or potential chemical hazards at the site. Every effort must be made to reduce or eliminate these hazards. Those that cannot be eliminated must be guarded against using engineering controls and/or personal protective equipment.

3.1 Physical Hazards

3.1.1 Tripping Hazards

An area of risk associated with on-site activities are presented by uneven ground, concrete, curbstones or equipment which may be present at the site thereby creating a potential tripping hazard. During intrusive work, care should be taken to mark or remove any obstacles within the exclusion zone.

3.1.2 Climbing Hazards

During site activities, workers may have to work on drilling equipment by climbing. The drilling contractor will conform with any applicable NIOSH and OSHA requirements or climbing activities.

3.1.3 Cuts and Lacerations

Field activities that involve drilling activities usually involve contact with certain technical drilling machinery and tooling. A first aid kit approved by the American Red Cross will be available during all intrusive activities.

3.1.4 Lifting Hazards

Improper lifting by workers is one of the leading causes of industrial injuries. Field workers in the drilling program may be required to lift heavy objects. Therefore, all members of the field crew should be trained in the proper methods of lifting heavy objects. All workers should be cautioned against lifting objects too heavy for one person.

3.1.5 Utility Hazards

Before conducting any drilling, the drilling contractor will be responsible for locating and verifying all existing utilities at each boring location.

3.1.6 Traffic Hazards

All traffic, vehicular and pedestrian, shall be maintained and protected at all times consistent with local, state and federal agency regulations regarding such traffic and in accordance with DOT guidelines. The drilling contractor shall carry on his operations without undue interference or delays to traffic. The drilling contractor shall furnish all labor, materials, guards, barricades, signs, lights, and anything else necessary to maintain traffic and to protect his work and the public, during operations.

3.2 Work in Extreme Temperatures

Work under extremely hot or cold weather conditions requires special protocols to minimize the chance that employees will be affected by heat or cold stress.

3.2.1 Heat Stress

The combination of high ambient temperature, high humidity, physical exertion, and personal protective apparel, which limits the dissipation of body heat and moisture, can cause heat stress. The following prevention, recognition and treatment strategies will be implemented to protect personnel from heat stress. Personnel will be trained to recognize the symptoms of heat stress and to apply the appropriate treatment.



1. Prevention
 - a. Provide plenty of fluids. Available in the support zone will be a 50% solution of fruit punch and water or plain water.
 - b. Work in Pairs. Individuals should avoid undertaking any activity alone.
 - c. Provide cooling devices. A spray hose and a source of water will be provided to reduce body temperature, cool protective clothing and/or act as a quick-drench shower in case of an exposure incident.
 - d. Adjustment of the work schedule. As is practical, the most labor-intensive tasks should be carried out during the coolest part of the day.
2. Recognition and Treatment
 - a. Heat Rash (or prickly heat):

Cause:	Continuous exposure to hot and humid air, aggravated by chafing clothing.
Symptoms:	Eruption of red pimples around sweat ducts accompanied by intense itching and tingling.
Treatment:	Remove source of irritation and cool skin with water or wet cloths.
 - b. Heat Cramps (or heat prostration)

Cause:	Profuse perspiration accompanied by inadequate replenishment of body water and electrolytes.
Symptoms:	Muscular weakness, staggering gait, nausea, dizziness, shallow breathing, pale and clammy skin, approximately normal body temperature.
Treatment:	Perform the following while making arrangement for transport to a medical facility. Remove the worker to a contamination reduction zone. Remove protective clothing. Lie worker down on back in a cool place and raise feet 6 to 12 inches. Keep warm but loosen all clothing. If conscious, provide sips of salt-water solution, using one teaspoon of salt in 12 ounces of water. Transport to a medical facility.
 - c. Heat Stroke

Cause:	Same as heat exhaustion. This is also an extremely serious condition.
Symptoms:	Dry hot skin, dry mouth, dizziness, nausea, headache, rapid pulse.
Treatment:	Cool worker immediately by immersing or spraying with cool water or sponge bare skin after removing protective clothing. Transport to hospital.

3.2.2 Cold Exposure

Exposure to cold weather, wet conditions and extreme wind-chill factors may results in excessive loss of body heat (hypothermia) and/or frostbite. To guard against cold exposure and to prevent cold injuries, appropriate warm clothing should be worn, warm shelter must be readily available, rest periods should be adjusted as needed, and the physical conditions of on-site field personnel should be closely monitored. Personnel and supervisors working on-site will be made aware of the signs and symptoms of frostbite and hypothermia such ass shivering, reduced blood pressure, reduced coordination, drowsiness, impaired judgment, fatigue, pupils dilated due to light and numbing of the toes and fingers.



3.3 Chemical Hazards

Chemical hazards will be full list of Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), Pesticides/PCBs, Target Analyte List Metals, and Perfluoroalkyl Substances (PFAS). The primary routes of exposure to the identified contaminants in soil, groundwater or soil vapor to on-site construction workers are through inhalation, ingestion and absorption.

Appendix D includes information sheets for chemicals that may be encountered at the site.

3.3.1 Respirable Dust

Dust may be generated from vehicular traffic and/or drilling activities. If visible observation detects elevated levels of dust, a program of wetting will be employed by the site safety officer. If elevated dust levels persist, the site safety office will employ dust monitoring using a particulate monitor. If monitoring detects concentrations greater than 150 $\mu\text{g}/\text{m}^3$ over daily background, the site safety officer will take corrective actions as defined herein, including the use of water for dust suppression and if this is not effective, requiring workers to wear APRs with efficiency particulate air (HEPA) cartridges.

Absorption pathways for dust and direct contact with soils or groundwater will be mitigated with the implementation of latex gloves, hand washing and decontamination exercises when necessary.

3.3.2 Dust Control and Monitoring During Earthwork

Dust generated during site activities or other earthwork may contain contaminants identified in soils at the site. Dust will be controlled by wetting the working surface with water. Calcium chloride may be used if the problem cannot be controlled with water. Air monitoring and dust control techniques are specified in a site-specific Dust Control Plan (if applicable). Site workers will not be required to wear APR's unless dust concentrations are consistently over 150 $\mu\text{g}/\text{m}^3$ over site-specific background in the breathing zone as measured by a dust monitor unless the site safety officer directs workers to wear APRs. The site safety officer will use visible dust as an indicator to implement the dust control plan.

3.3.3 Organic Vapors

The site safety officer will periodically monitor organic vapors with a Photo-ionization Detector (PID) during site activities to determine whether organic vapor concentrations exceed action levels shown in Section 5 and/or the Community Air Monitoring Plan.



4.0 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) shall be selected in accordance with the site air monitoring program, OSHA 29 CFR 1910.120(c), (g), 1910.132, and COVID-19 requirements. Protective equipment shall be NIOSH approved and respiratory protection including face mask shall conform to OSHA 29 CFR Part 1910.133, 1910.134, and COVID-19 specifications; head protection shall conform to 1910.135; eye and face protection shall conform to 1910.133 and COVID-19; and foot protection shall conform to 1910.136. The only true difference among the levels of protection from D thru B is the addition of the type of respiratory protection. **It is anticipated that work will be performed in Level D PPE.**

4.1 Level D

Level D PPE shall be donned when the atmosphere contains no known hazards and work functions preclude splashes, immersion, or the potential for inhalation of, or contact with, hazardous concentrations of harmful chemicals. Level D PPE consists of:

- standard work clothes, coveralls, or Tyvek, as needed;
- steel toe and steel shank work boots;
- hard hat;
- gloves, as needed;
- safety glasses and/or face shield;
- face mask;
- hearing protection;
- equipment replacements are available as needed.

4.2 Level C

Level C PPE shall be donned when sustained concentrations of measured total organic vapors in the breathing zone exceed background concentrations (using a portable OVA, or equivalent), by more than 5 ppm. The specifications on the APR filters used must be appropriate for contaminants identified or expected to be encountered. Level C PPE shall be donned when the identified contaminants have adequate warning properties and criteria for using APR have been met. Level C PPE consists of:

- chemical resistant or coated Tyvek coveralls;
- steel-toe and steel-shank work boots;
- chemical resistant over-boots or disposable boot covers;
- disposable inner gloves (surgical gloves);
- disposable outer gloves;
- full face APR fitted with organic vapor/dust and mist filters or filters appropriate for the identified or expected contaminants;
- hard hat;
- face/splash shield, as needed; and,
- ankles/wrists taped with duct tape.

The site safety officer will verify if Level C is appropriate by checking organic vapor concentrations using compound and/or class-specific detector tubes. The exact PPE ensemble is decided on a site-by-site basis by the Site Safety Officer with the intent to provide the most protective and efficient worker PPE.



4.3 Activity-Specific Levels of Personal Protection

The required level of PPE is activity-specific and is based on air monitoring results (Section 4.0) and properties of identified or expected contaminants. **It is expected that site work will be performed in Level D.** If air monitoring results indicate the necessity to upgrade the level of protection, engineering controls (i.e., Facing equipment away from the wind and placing site personnel upwind of drilling, active venting, etc.) will be implemented before requiring the use of respiratory protection.



5.0 AIR MONITORING AND ACTION LEVELS

29 CFR 1910.120(h) specifies that monitoring shall be performed where there may be a question of employee exposure to hazardous concentrations of hazardous substances in order to assure proper selection of engineering controls, work practices and personal protective equipment so that employees are not exposed to levels which exceed permissible exposure limits or published exposure levels if there are no permissible exposure limits, for hazardous substances.

5.1 Air Monitoring Requirements

If site work is performed, air will be monitored for VOCs with a portable MiniRAE 3000 Photo Ionization Detector (PID), or the equivalent. If necessary, Lower Explosive Limit (LEL) and oxygen will be monitored with a Combustible Gas Indicator (CGI). If appropriate, fugitive dust will be monitored using a MiniRAE Model PDM-3 aerosol monitor. Air will be monitored when any of the following conditions apply:

- initial site entry;
- during any work where a potential IDLH condition or flammable atmosphere could develop;
- work begins on another portion of the site;
- contaminants, other than those previously identified, have been discovered;
- each time a different task or activity is initiated;
- during boring, trenching and/or excavation work.

The designated site safety officer will record air monitoring data and ensure that air monitoring instruments are calibrated and maintained in accordance with manufacturer's specifications. Instruments will be zeroed daily and checked for accuracy. Monitoring results will be recorded in a field notebook and will be transferred to instrument reading logs.

5.2 Work Stoppage Responses

The following work stoppage responses will be initiated whenever one or more of the action levels necessitating is exceeded:

1. The SSO will be consulted immediately.
2. All personnel (except as necessary for continued monitoring and contaminant migration, if applicable) will be cleared from the work area (e.g., from the exclusion zone).
3. Monitoring will be continued until intrusive work resumes.

5.3 Action Levels During Site Activities

Instrument readings will be taken in the breathing zone within the Site unless otherwise noted. Each action level is independent of all other action levels in determining responses.

Organic Vapors (PID)	LEL %	Responses
0-1 ppm above background	0%	<ul style="list-style-type: none">• Continue with site drilling activities• Level D protection• Continue monitoring every 10 minutes
1-50 ppm Above Background, Sustained Reading	1-30%	<ul style="list-style-type: none">• Continue with site drilling activities• Level D protection



		<ul style="list-style-type: none"> Continue monitoring every 10 minutes
50-250 ppm Above Background, Sustained Reading	30-60%	<ul style="list-style-type: none"> Continue with site drilling activities Level D protection and employ engineering controls Continue monitoring for organic vapors 200 ft downwind Continuous monitoring for LEL
>250 ppm Above Background, Sustained Reading	>60%	<ul style="list-style-type: none"> Discontinue drilling activities, unless PID is only action level exceeded Employ engineering controls Continuous monitoring for organic vapors 200 ft downwind.

Notes: Air monitoring will occur in the breathing zone 30 inches above the site grade.

If action levels for any one of the monitoring parameters are exceeded, the appropriate responses listed in the right-hand column should be taken.

5.4 Community Air Monitoring Plan (CAMP)

Real-time air monitoring for volatile organic compounds (VOCs) and particulate levels at the perimeter of the exclusion zone or work area will be performed. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Periodic monitoring during sample collection, for instance, will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence. Exceedances of action levels observed during performance of the Community Air Monitoring Plan (CAMP) will be included in the Daily Report and reported to the NYSDEC Project Manager and NYSDOH Project Manager.

A Special Community Monitoring Plan is put in place for this Site to fulfil the special requirements for work within 20 feet of potentially exposed individuals and structures and special requirements for indoor work with co-located residences or facilities as per the following:

- Special Requirements for work within 20 feet of potentially exposed individuals and structures: As the Site is within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates will reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices are considered to prevent exposures related to the work activities and to control dust and odors. Consideration is given to implementing the planned activities during weekends or evening hours in non-residential settings, when the potentially exposed populations are at a minimum.
 - If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring will occur within the occupied structure(s). Depending upon the nature of



- contamination, chemical-specific colorimetric tubes of sufficient sensitivity may be necessary for comparing the exposure point concentrations with appropriate pre-determined response levels (response actions will also be pre-determined). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings will be discussed with NYSDOH prior to commencement of the work.
- If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m³, work activities will be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m³ or less at the monitoring point.
 - Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions will be pre-determined, as necessary, for each site.
 - **Special Requirements for Indoor Work with Co-Located Residences or Facilities:** Unless a self-contained, negative-pressure enclosure with proper emission controls will encompass the work area, all individuals not directly involved with the planned work will be absent from the room in which the work will occur. Monitoring requirements will be as stated above under “Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures” except that in this instance “nearby/occupied structures” would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings, conduits, etc.) relative to adjoining rooms, will be understood and the monitoring locations established accordingly. In these situations, as recommended, the exhaust fans or other engineering controls will be used to create negative air pressure within the work area during remedial activities. Additionally, the planned work will be implemented during hours (e.g., weekends or evenings) when building occupancy is at a minimum.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Similarly, upwind concentrations will also be monitored continuously during all ground intrusive work. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shut down.

All 15-minute readings must be recorded and be available for DEC personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.



Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration will be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m³) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m³ above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m³ above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m³ of the upwind level and in preventing visible dust migration.
- Exceedances observed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers and included in the Daily Report.



6.0 SITE CONTROL

6.1 Work Zones

The primary purpose of site controls is to establish the perimeter of a hazardous area, to reduce the migration of contaminants into clean areas, and to prevent access or exposure to hazardous materials by unauthorized persons. When operations are to take place involving hazardous materials, the site safety officer will establish an exclusion zone, a decontamination zone, and a support zone. These zones "float" (move around the site) depending on the tasks being performed on any given day. The site safety officer will outline these locations before work begins and when zones change. The site safety officer records this information in the site logbook.

Due to the dimensions of the Site and the work area, it is expected that an exclusion zone will not be required.

All onsite workers during drilling activities must provide evidence of OSHA 40-hour Hazardous Waste Operations and Emergency Response Operations training to conduct work within the exclusion zone established by the site safety officer. The exclusion zone is defined by the site safety officer but will typically be a 50-foot area around work activities. Gross decontamination (as determined by the site Health and Safety Officer) is conducted in the exclusion zone; all other decontamination is performed in the decontamination zone or trailer, if provided.

Protective equipment is removed in the decontamination zone. Disposable protective equipment is stored in receptacles staged in the decontamination zone, and non-disposable equipment is decontaminated. All personnel and equipment exit the exclusion zone through the decontamination zone. If a decontamination trailer is provided the first aid equipment, an eye wash unit, and drinking water are kept in the decontamination trailer.

The support zone is used for vehicle parking, daily safety meetings, and supply storage. Eating, drinking, and smoking are permitted only in the support zone. When a decontamination trailer is not provided, the eye wash unit, first aid equipment, and drinking water are kept at a central location designated by the site safety officer.



7.0 CONTINGENCY PLAN/EMERGENCY RESPONSE PLAN

Site personnel must be prepared in the event of an emergency. Emergencies can take many forms: illnesses, injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather. Emergency telephone numbers and a map to the hospital will be posted in the command post. Site personnel should be familiar with the emergency procedures, and the locations of site safety, first aid, and communication equipment.

7.1 Emergency Equipment On-site

Private telephones:	Site personnel.
Two-way radios:	Site personnel where necessary.
Emergency Alarms:	On-site vehicle horns*.
First aid kits:	On-site, in vehicles or office.
Fire extinguisher:	On-site, in office or on equipment.

* Horns: Air horns will be supplied to personnel at the discretion of the project superintendent or site safety officer.

7.2 Emergency Telephone Numbers

General Emergencies	911
Fire Department	911
Coney Island Hospital Emergency Department	(718) 616-4327
NYSDEC Spills Hotline	(800) 457-7362
National Response Center	(800) 424-8802
Poison Control	(800) 222-1222
Field Scientist	(347) 304-1514
Sr. Project Manager	(347) 728-0768
Site Safety Officer	(646) 249-6129

7.3 Personnel Responsibilities During an Emergency

The project manager is primarily responsible for responding to and correcting any emergency situations. However, in the absence of the project manager, the site safety officer shall act as the project manager's on-site designee and perform the following tasks:

- Take appropriate measures to protect personnel including: withdrawal from the exclusion zone, evacuate and secure the site, or upgrade/downgrade the level of protective clothing and respiratory protection;
- Ensure that appropriate federal, state, and local agencies are informed, and emergency response plans are coordinated. In the event of fire or explosion, the local fire department should be summoned immediately. If toxic materials are released to the air, the local authorities should be informed in order to assess the need for evacuation;
- Ensure appropriate decontamination, treatment, or testing for exposed or injured personnel;
- Determine the cause of incidents and make recommendations to prevent recurrence; and,
- Ensure that all required reports have been prepared.

The following key personnel are planned for this project:

- Danny Singh, Sr. Project Manager (347) 728-0768
- Drumita Dmello, Site Safety Officer (646) 249-6129



7.4 Medical Emergencies

A person who becomes ill or injured in the exclusion zone will be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination will be completed and first aid administered prior to transport. First aid will be administered while waiting for an ambulance or paramedics. A Field Accident Report (**Appendix E**) must be filled out for any injury.

A person transporting an injured/exposed person to a clinic or hospital for treatment will take the directions to the hospital (**Appendix F**) and information on the chemical(s) to which they may have been exposed (**Appendix D**).

7.5 Fire or Explosion

In the event of a fire or explosion, the local fire department will be summoned immediately. The site safety officer or his designated alternate will advise the fire commander of the location, nature and identification of the hazardous materials on-site. If it is safe to do so, site personnel may:

- use of firefighting equipment available on site; or,
- remove or isolate flammable or other hazardous materials that may contribute to the fire.

7.6 Evacuation Routes

Evacuation routes established by work area locations for each site will be reviewed prior to commencing site operations. As the work areas change, the evacuation routes will be altered accordingly, and the new route will be reviewed.

Under extreme emergency conditions, evacuation is to be immediate without regard for equipment. The evacuation signal will be a continuous blast of a vehicle horn, if possible, and/or by verbal/radio communication. When evacuating the site, personnel will follow these instructions:

- Keep upwind of smoke, vapors, or spill location.
- Exit through the decontamination corridor if possible.
- If evacuation through the decontamination corridor is not possible, personnel should remove contaminated clothing once they are in a safe location and leave it near the exclusion zone or in a safe place.
- The site safety officer will conduct a head count to ensure that all personnel have been evacuated safely. The head count will be correlated to the site and/or exclusion zone entry/exit log.
- If emergency site evacuation is necessary, all personnel are to escape the emergency situation and decontaminate to the maximum extent practical.

7.7 Spill Control Procedures

Spills associated with site activities may be attributed to project equipment and include gasoline, diesel and hydraulic oil. In the event of a leak or a release, site personnel will inform their supervisor immediately, locate the source of spillage and stop the flow if it can be done safely. A spill containment kit including absorbent pads, booms and/or granulated speedy dry absorbent material will be available to site personnel to facilitate the immediate recovery of the spilled material. Daily inspections of site equipment components including hydraulic lines, fuel tanks, etc. will be performed by their respective operators as a preventative measure for equipment leaks and to ensure equipment soundness. In the event of a spill, site personnel will immediately notify the NYSDEC (1-800-457-7362), and a spill number will be generated.



7.8 Vapor Release Plan

If work zone organic vapor (excluding methane) exceeds 5 ppm, then a downwind reading will be made either 200 feet from the work zone or at the property line, whichever is closer. If readings at this location exceed 5 ppm over background, the work will be stopped. If 5 ppm of VOCs are recorded over background on a PID at the property line, then an off-site reading will be taken within 20 feet of the nearest residential or commercial property, whichever is closer. If efforts to mitigate the emission source are unsuccessful for 30 minutes, then the designated site safety officer will:

- contact the local police;
- continue to monitor air every 30 minutes, 20 feet from the closest off-site property. If two successive readings are below 5 ppm (non-methane), off-site air monitoring will be halted.
- All property line and off-site air monitoring locations and results associated with vapor releases will be recorded in the site safety logbook.



APPENDIX A

SITE SAFETY ACKNOWLEDGEMENT FORM



DAILY BRIEFING SIGN-IN SHEET

Date: _____ Person Conducting Briefing: _____

Project Name and Location: _____

1. AWARENESS (topics discussed, special safety concerns, recent incidents, etc.): _____

2. OTHER ISSUES (HASP changes, attendee comments, etc.): _____

3. ATTENDEES (Print Name):

1.	10.
2.	11.
3.	12.
4.	13.
5.	14.
6.	15.
7.	16.
8.	17.
9.	18.



APPENDIX B

COVID-19 DISCLOSURE FORM



Declaration Form (COVID-19)

Due to COVID-19, we are asking all employees, sub-contractors and clients to sign a declaration prior to coming on to the Site: _____ for the Health and Safety of everyone involved.

Prior to coming to the Site, we ask that you review the questions below and make a declaration if your response to all the questions below are “No”.

- Have you, or anyone whom you are sharing a residence with, been in contact with any person suffering or suspected to be suffering from COVID-19 in the last 14-days?
- Did you have any fever in the last 48-hours or do you have the respiratory symptoms (e.g., cough, runny nose, sore throat or breathing difficulty)?
- Have you travelled outside the U.S in the last 21-days?

If your response to any of the above questions is “Yes”, then we regret to inform that you are not permitted to the Site at this time.

By signing below, it is your declaration that your responses to the above questions are “No”, and that this declaration is true and accurate to the best of your knowledge.

Date	Print Name	Temperature (F)	Signature



APPENDIX C

SITE SAFETY PLAN AMENDMENTS



TYLL ENGINEERING & CONSULTING PC

SITE SAFETY PLAN AMENDMENT FORM

Site Safety Plan Amendment #: _____

Site Name: _____

Reason for Amendment: _____

Alternative Procedures: _____

Required Changes in PPE: _____

Project Superintendent (signature)

Date

Health and Safety Consultant (signature)

Date

Site Safety Officer (signature) Date



APPENDIX D ***PROPOSED STRUCTURAL PLANS***

Please see Appendix A of RAWP



APPENDIX E

CHEMICAL HAZARDS

CHEMICAL HAZARDS

The attached International Chemical Safety Cards are provided for contaminants of concern that have been identified in soils and/or groundwater at the site.

1,1,1,2-TETRACHLOROETHANE**ICSC: 1486 (April 2004)****CAS #: 630-20-6****UN #: 1702****EC Number: 211-135-1**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Gives off irritating or toxic fumes (or gases) in a fire.	NO contact with hot surfaces. NO open flames.	In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Headache. Nausea. Shortness of breath. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness. Burning sensation. Pain.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Headache. Nausea.	Do not eat, drink, or smoke during work.	Do NOT induce vomiting. Refer for medical attention. Give one or two glasses of water to drink.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in dry sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II
STORAGE	
Separated from strong oxidants and strong bases. Well closed.	
PACKAGING	
Do not transport with food and feedstuffs.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

1,1,1,2-TETRACHLOROETHANE**ICSC: 1486****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

YELLOW-TO-RED LIQUID.

Physical dangers**Chemical dangers**

Decomposes on heating. This produces toxic and corrosive gases including hydrogen chloride. Reacts with strong bases and strong oxidants.

Formula: C₂H₂Cl₄ / Cl₃CCH₂Cl

Molecular mass: 167.8

Boiling point: 130.5°C

Melting point: -70.2°C

Relative density (water = 1): 1.54

Solubility in water, g/100ml at 25°C: 0.11

Vapour pressure, kPa at 25°C: 1.9

Octanol/water partition coefficient as log Pow: 2.66

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by ingestion and by inhalation.

Effects of short-term exposure

The substance is irritating to the eyes and skin. The substance may cause effects on the central nervous system.

Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS****ENVIRONMENT**

The substance is harmful to aquatic organisms.

NOTES

See ICSC 0332.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,1,1-TRICHLOROETHANE**ICSC: 0079 (April 2007)**


Methyl chloroform
Methyltrichloromethane
alpha-Trichloroethane

CAS #: 71-55-6**UN #: 2831****EC Number: 200-756-3**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Heating will cause rise in pressure with risk of bursting. Gives off irritating or toxic fumes (or gases) in a fire. See Notes.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Headache. Dizziness. Drowsiness. Nausea. Incoordination. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Nausea. Vomiting. Abdominal pain. Diarrhoea. Further see Inhalation.	Do not eat, drink, or smoke during work.	Do NOT induce vomiting. Rinse mouth. Give a slurry of activated charcoal in water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: self-contained breathing apparatus. Ventilation. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>WARNING</p> </div> <p>Causes mild skin irritation Causes eye irritation May cause drowsiness and dizziness May cause damage to cardiovascular system if inhaled Harmful to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III</p>
STORAGE	
Separated from food and feedstuffs, strong oxidants, aluminium, magnesium and zinc. Cool. Dry. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

1,1,1-TRICHLOROETHANE**ICSC: 0079****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air.

Chemical dangers

Decomposes on burning. This produces toxic and corrosive fumes.
 Reacts violently with aluminium, aluminium alloys, magnesium, bases, strong oxidants, acetone and zinc.

Formula: $C_2H_3Cl_3$ / CCl_3CH_3

Molecular mass: 133.4

Boiling point: 74°C

Melting point: -30°C

Relative density (water = 1): 1.34

Solubility in water: poor

Vapour pressure, kPa at 20°C: 13.3

Relative vapour density (air = 1): 4.6

Flash point: see Notes

Auto-ignition temperature: 537°C

Explosive limits, vol% in air: 8-16

Octanol/water partition coefficient as log Pow: 2.49

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure

The substance is mildly irritating to the eyes, respiratory tract and skin.
 The substance may cause effects on the central nervous system. This may result in lowering of consciousness. Exposure at high levels could cause cardiac dysrhythmia.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 350 ppm as TWA; 450 ppm as STEL; A4 (not classifiable as a human carcinogen); BEI issued.

MAK: 550 mg/m³, 100 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: C.EU-OEL: 555 mg/m³, 100 ppm as TWA; 1110 mg/m³, 200 ppm as STEL**ENVIRONMENT**

The substance is harmful to aquatic organisms.

NOTES

Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions.

The substance burns only in excess oxygen or if a strong source of ignition is present.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

Depending on the degree of exposure, periodic medical examination is suggested.

Use of alcoholic beverages enhances the harmful effect.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn, N; Note: F; R: 20-59; S: (2)-24/25-59-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,1,2,2-TETRACHLOROETHANE**ICSC: 0332 (April 2017)**


Acetylene tetrachloride
 sym-Tetrachloroethane
 1,1-Dichloro-2,2-dichloroethane

CAS #: 79-34-5**UN #: 1702****EC Number: 201-197-8**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO contact with incompatible substances. See Chemical Dangers.	In case of fire in the surroundings, use appropriate extinguishing media.

STRICT HYGIENE! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Headache. Nausea. Vomiting. Dizziness. Drowsiness. Convulsions. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Dry skin. Further see Inhalation.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer for medical attention.
Ingestion	Abdominal pain. Nausea. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Ventilation. Collect leaking liquid in covered containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>Toxic if swallowed or if inhaled Causes skin and eye irritation May cause respiratory irritation May cause drowsiness or dizziness May cause damage to liver May cause damage to liver through prolonged or repeated exposure Suspected of causing cancer Suspected of causing genetic defects Toxic to aquatic life</p>
STORAGE	
Separated from strong bases, alkali metals and food and feedstuffs. Well closed. Cool. Keep in the dark. Ventilation along the floor. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	<p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II</p>



International
Labour
Organization

World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021



European
Commission

1,1,2,2-TETRACHLOROETHANE**ICSC: 0332****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Decomposes on heating and under the influence of air, UV light and moisture. This produces toxic and corrosive gases including hydrogen chloride and phosgene. Reacts violently with alkali metals, strong bases and powdered metals. This produces toxic and corrosive gases. Attacks plastics and rubber.

Formula: C₂H₂Cl₄ / CHCl₂CHCl₂

Molecular mass: 167.9

Boiling point: 146°C

Melting point: -42,5°C

Relative density (water = 1): 1.59

Solubility in water, g/100ml at 20°C: 0.29

Vapour pressure, Pa at 20°C: 647

Relative vapour density (air = 1): 5.8

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.03

Viscosity: 1.11 mm²/s at 20°C

Octanol/water partition coefficient as log Pow: 2.39

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system, liver and kidneys. This may result in central nervous system depression and impaired functions. Exposure could cause unconsciousness. Exposure could cause death.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system and liver. This may result in impaired functions. This substance is possibly carcinogenic to humans. May cause heritable genetic damage to human germ cells.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 14 mg/m³, 2 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: D

ENVIRONMENT

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION**EC Classification**


Symbol: T+, N; R: 26/27-51/53; S: (1/2)-38-45-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,1,2-TRICHLOROETHANE**ICSC: 0080 (April 2009)**Vinyl trichloride
beta-Trichloroethane**CAS #: 79-00-5****UN #: 2810****EC Number: 201-166-9**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Heating will cause rise in pressure with risk of bursting. See Notes.	NO open flames. NO contact with hot surfaces.	Use powder, water spray, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Dizziness. Drowsiness. Headache. Nausea.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness.	Wear safety spectacles or face shield.	Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.
Ingestion	Aspiration hazard! See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention . Do NOT induce vomiting.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>Harmful if swallowed Toxic if inhaled Causes mild skin irritation Causes eye irritation May cause drowsiness or dizziness May be fatal if swallowed and enters airways Harmful to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III</p>
STORAGE	
Separated from strong oxidants, strong bases and metals. Well closed. Ventilation along the floor. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	
PACKAGING	
Marine pollutant.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

1,1,2-TRICHLOROETHANE**ICSC: 0080****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air.

Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Reacts with strong bases, strong oxidants and metals. This generates fire and explosion hazard.

Formula: C₂H₃Cl₃ / CHCl₂CH₂Cl

Molecular mass: 133.4

Boiling point: 114°C

Melting point: -36°C

Relative density (water = 1): 1.4

Solubility in water, g/100ml at 20°C: 0.45 (very poor)

Vapour pressure, kPa at 20°C: 2.5

Relative vapour density (air = 1): 4.6

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.09

Explosive limits, vol% in air: 6-15.5

Octanol/water partition coefficient as log Pow: 2.35

Viscosity: 1.17 mm²/s at 25°C**EXPOSURE & HEALTH EFFECTS****Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. The substance is mildly irritating to the skin. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. The substance may cause effects on the kidneys and liver. This may result in impaired functions. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. Repeated or prolonged contact with skin may cause dryness and cracking.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 5,5 mg/m³, 1 ppm; peak limitation category: I(2); skin absorption (H); pregnancy risk group: D; carcinogen category: 3**ENVIRONMENT**

The substance is harmful to aquatic organisms.

NOTES

Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions.

Use of alcoholic beverages enhances the harmful effect.

The relation between odour and the occupational exposure limit cannot be indicated.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn; R: 20/21/22-40-66; S: (2)-9-36/37-46


All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,1-DICHLOROETHANE**ICSC: 0249 (April 2017)**Ethane, 1,1-dichloro-
Ethylidene chloride**CAS #: 75-34-3****UN #: 2362****EC Number: 200-863-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	Use water spray, foam, powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Lethargy. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Roughness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: self-contained breathing apparatus. Do NOT wash away into sewer. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>Highly flammable liquid and vapour May cause damage to liver and kidneys through prolonged or repeated exposure Harmful to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II</p>
STORAGE	
Fireproof. See Chemical Dangers. Cool.	
PACKAGING	
Marine pollutant.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

1,1-DICHLOROETHANE**ICSC: 0249****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers

Decomposes on heating and on burning. This produces toxic and corrosive fumes including phosgene (see ICSC 0007) and hydrogen chloride (see ICSC 0163). Reacts violently with strong oxidants, alkali metals, alkaline earth metals and powdered metals. This generates fire and explosion hazard. Attacks aluminium, iron and polyethylene. Contact with strong caustic causes formation of flammable and toxic acetaldehyde gas.

Formula: CH₃CHCl₂

Molecular mass: 99.0

Boiling point: 57°C

Melting point: -98°C

Relative density (water = 1): 1.2

Solubility in water, g/100ml at 20°C: 0.6 (poor)

Vapour pressure, kPa at 20°C: 24

Relative vapour density (air = 1): 3.4

Flash point: -6°C c.c.

Auto-ignition temperature: 458°C

Explosive limits, vol% in air: 5.6-11.4

Octanol/water partition coefficient as log Pow: 1.8

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes and upper respiratory tract. The substance may cause effects on the central nervous system. Exposure at high levels could cause unconsciousness.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the kidneys and liver.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 100 ppm as TWA; A4 (not classifiable as a human carcinogen).

MAK: 205 mg/m³, 50 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: C; carcinogen category: 3.EU-OEL: 412 mg/m³, 100 ppm as TWA; (skin)**ENVIRONMENT**

The substance is harmful to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION**EC Classification**

Symbol: F, Xn; R: 11-22-36/37-52/53; S: (2)-16-23-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

VINYLIDENE CHLORIDE**ICSC: 0083 (April 2014)**


1,1-Dichloroethene
1,1-Dichloroethylene
VDC

CAS #: 75-35-4**UN #: 1303 (stabilized)****EC Number: 200-864-0**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Extremely flammable. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking handtools.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Dizziness. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Remove all ignition sources. Consult an expert! Personal protection: filter respirator for organic vapours of low boiling point adapted to the airborne concentration of the substance. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  </div> <p>DANGER</p> <p>Extremely flammable liquid and vapour Toxic if swallowed May be harmful if inhaled May cause drowsiness or dizziness May cause damage to liver and kidneys through prolonged or repeated exposure Harmful to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: I</p>
STORAGE	
Store only if stabilized. Fireproof. Keep in the dark. Cool. Separated from incompatible materials. See Chemical Dangers. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Airtight. Unbreakable packaging. Put breakable packaging into closed unbreakable container. Marine pollutant.	



International
Labour
Organization

World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

VINYLIDENE CHLORIDE

ICSC: 0083

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

VOLATILE COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible. Vapours are uninhibited and may polymerize, causing blockage of vents.

Chemical dangers

The substance can readily form explosive peroxides. The substance readily polymerizes due to heating or under the influence of oxygen, sunlight, copper or aluminium. This generates fire or explosion hazard. May explode on heating or on contact with flames. Decomposes on burning. This produces toxic and corrosive fumes of hydrogen chloride and phosgene. Reacts violently with oxidants.

Formula: $C_2H_2Cl_2$ / $H_2C=CCl_2$

Molecular mass: 97.0

Boiling point: 32°C

Melting point: -122°C

Relative density (water = 1): 1.2

Solubility in water, g/100ml at 25°C: 0.25 (very poor)

Vapour pressure, kPa at 20°C: 66.5

Relative vapour density (air = 1): 3.3

Relative density of the vapour/air-mixture at 20°C (air = 1): 2.5

Flash point: -25°C c.c.

Auto-ignition temperature: 530°C

Explosive limits, vol% in air: 5.6-16

Octanol/water partition coefficient as log Pow: 2.41

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

The substance is mildly irritating to the eyes and upper respiratory tract. Exposure far above the OEL could cause lowering of consciousness.

Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance may have effects on the kidneys and liver. This may result in liver function impairment and kidney impairment. Tumours have been detected in experimental animals but may not be relevant to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as TWA; A4 (not classifiable as a human carcinogen).

MAK: 8.0 mg/m³, 2 ppm; peak limitation category: II(2); carcinogen category: 3; pregnancy risk group: C.EU-OEL: 8 mg/m³, 2 ppm as TWA; 20 mg/m³, 5 ppm as STEL

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

The odour warning when the exposure limit value is exceeded is insufficient.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION

EC Classification

Symbol: F+, Xn; R: 12-20-40; S: (2)-7-16-29-36/37-46; Note: D

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,2,4-TRICHLOROBENZENE**ICSC: 1049 (November 2003)**1,2,4-Trichlorobenzol
unsym-Trichlorobenzene**CAS #: 120-82-1****UN #: 2321****EC Number: 204-428-0**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, foam, carbon dioxide.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness. Roughness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Sore throat. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. If solid: sweep spilled substance into sealable containers. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Separated from strong oxidants, acids and food and feedstuffs.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

1,2,4-TRICHLOROBENZENE**ICSC: 1049****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID OR WHITE CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces toxic fumes including hydrogen chloride. Reacts violently with oxidants.

Formula: C₆H₃Cl₃

Molecular mass: 181.5

Boiling point: 213°C

Melting point: 17°C

Relative density (water = 1): 1.5

Solubility in water, mg/l: 34.6

Vapour pressure, Pa at 25°C: 40

Relative vapour density (air = 1): 6.26

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.002

Flash point: 105°C c.c.

Auto-ignition temperature: 571°C

Explosive limits, vol% in air: 2.5-6.6 (at 150°C)

Octanol/water partition coefficient as log Pow: 3.98

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the liver.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as STEL.

MAK: skin absorption (H); carcinogen category: 3.

EU-OEL: 15.1 mg/m³, 2 ppm as TWA; 37.8 mg/m³, 5 ppm as STEL; (skin)**ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

The occupational exposure limit value should not be exceeded during any part of the working exposure. See ICSCs 0344 and 1222.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn, N; R: 22-38-50/53; S: (2)-23-37/39-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,2,4-TRIMETHYLBENZENE**ICSC: 1433 (June 2002)**

Pseudocumene

CAS #: 95-63-6**UN #: 1993****EC Number: 202-436-9**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 44°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 44°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use alcohol-resistant foam, dry powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Confusion. Cough. Dizziness. Drowsiness. Headache. Sore throat. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Dry skin.	Protective gloves.	Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer. Do NOT let this chemical enter the environment.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III
STORAGE	
Fireproof. Separated from strong oxidants. Well closed. Keep in a well-ventilated room.	
PACKAGING	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

1,2,4-TRIMETHYLBENZENE**ICSC: 1433****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces toxic and irritating fumes.
 Reacts violently with strong oxidants. This generates fire and explosion hazard.

Formula: C₉H₁₂

Molecular mass: 120,2

Boiling point: 169°C

Melting point: -44°C

Relative density (water = 1): 0.88

Solubility in water: very poor

Relative vapour density (air = 1): 4.1

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01

Flash point: 44°C c.c.

Auto-ignition temperature: 500°C

Explosive limits, vol% in air: 0.9-6.4

Octanol/water partition coefficient as log Pow: 3.8

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. Repeated or prolonged inhalation may cause effects on the lungs. This may result in chronic bronchitis. The substance may have effects on the central nervous system and blood. See Notes.

OCCUPATIONAL EXPOSURE LIMITSEU-OEL: 100 mg/m³, 20 ppm as TWA.MAK: 100 mg/m³, 20 ppm; peak limitation category: II(2); pregnancy risk group: C**ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

Use of alcoholic beverages enhances the harmful effect.

Depending on the degree of exposure, periodic medical examination is suggested.

See ICSCs 1155, 1362 and 1389.

1,3,5-Trimethylbenzene (Mesitylene) is classified as a marine pollutant.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn, N; R: 10-20-36/37/38-51/53; S: (2)-26-61


All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

ETHYLENE DIBROMIDE**ICSC: 0045 (June 2012)**1,2-Dibromoethane
EDB**CAS #: 106-93-4****UN #: 1605****EC Number: 203-444-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion. See Chemical Dangers.	NO contact with incompatible materials: See Chemical Dangers	In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Burning sensation. Cough. Laboured breathing. Shortness of breath. Vomiting. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Vomiting. Drowsiness.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>Toxic if swallowed, in contact with skin or if inhaled Causes skin and eye irritation May cause respiratory irritation May cause cancer Suspected of damaging fertility or the unborn child Causes damage to liver and kidneys May cause drowsiness or dizziness Harmful to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: I</p>
STORAGE	
Separated from strong oxidants, strong bases, powdered metals and food and feedstuffs. See Chemical Dangers. Ventilation along the floor. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

ETHYLENE DIBROMIDE

ICSC: 0045

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR. TURNS BROWN ON EXPOSURE TO LIGHT.

Physical dangers**Chemical dangers**

Decomposes on heating or on burning and on contact with hot surfaces. This produces toxic and corrosive fumes of hydrogen bromide and bromine (see ICSC 0107). Reacts violently with powdered aluminium, powdered magnesium, calcium, strong bases and strong oxidants. This generates fire and explosion hazard. Attacks some forms of plastic, rubber and coatings.

Formula: $\text{Br}(\text{CH}_2)_2\text{Br}$ / $\text{C}_2\text{H}_4\text{Br}_2$

Molecular mass: 187.9

Boiling point: 131°C

Melting point: 10°C

Relative density (water = 1): 2.2

Solubility in water, g/100ml at 20°C: 0.34 (poor)

Vapour pressure, kPa at 20°C: 1.5

Relative vapour density (air = 1): 6.5

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.06

Octanol/water partition coefficient as log Pow: 1.96

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the liver and kidneys. This may result in tissue lesions. Exposure at high concentrations could cause lowering of consciousness and death. The effects may be delayed.

Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidneys, resulting in impaired functions. This substance is probably carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: skin absorption (H); carcinogen category: 2.

EU-OEL: 0.8 mg/m³, 0.1 ppm as TWA; (skin)

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

ADDITIONAL INFORMATION

EC Classification

Symbol: T, N; R: 45-23/24/25-36/37/38-51/53; S: 53-45-61; Note: E

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,2-DICHLOROBENZENE**ICSC: 1066 (November 2003)**

ortho-Dichlorobenzene

CAS #: 95-50-1**UN #: 1591****EC Number: 202-425-9**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Above 66°C explosive vapour/air mixtures may be formed.	NO open flames. Above 66°C use a closed system and ventilation.	Use water spray, powder, foam, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Drowsiness. Sore throat. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain. Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Separated from aluminium, oxidants and food and feedstuffs.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

1,2-DICHLOROBENZENE**ICSC: 1066****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS-TO-YELLOW LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces toxic and corrosive gases including hydrogen chloride. Reacts with aluminium and oxidants. Attacks plastics and rubber.

Formula: C₆H₄Cl₂

Molecular mass: 147.0

Boiling point: 180-183°C

Melting point: -17°C

Relative density (water = 1): 1.3

Solubility in water: very poor

Vapour pressure, kPa at 20°C: 0.16

Relative vapour density (air = 1): 5.1

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.006

Flash point: 66°C c.c.

Auto-ignition temperature: 648°C

Explosive limits, vol% in air: 2.2-9.2

Octanol/water partition coefficient as log Pow: 3.38

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system and liver. Exposure could cause lowering of consciousness.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the kidneys and blood.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 25 ppm as TWA; 50 ppm as STEL; A4 (not classifiable as a human carcinogen).

MAK: 61 mg/m³, 10 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: C.

EU-OEL: 122 mg/m³, 20 ppm as TWA; 306 mg/m³, 50 ppm as STEL; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. It is strongly advised not to let the chemical enter into the environment.

NOTES**ADDITIONAL INFORMATION****EC Classification**

Symbol: Xn, N; R: 22-36/37/38-50/53; S: (2)-23-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,2-DICHLOROETHANE**ICSC: 0250 (April 2013)**


Ethylene dichloride
1,2-Ethylene dichloride
Ethane dichloride

CAS #: 107-06-2**UN #: 1184****EC Number: 203-458-1**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive. Heating will cause rise in pressure with risk of bursting.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling.	Use water spray, foam, powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Nausea. Vomiting. Cough. Headache. Dizziness. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Administration of oxygen may be needed. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer immediately for medical attention.
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  </div> <p>DANGER</p> <p>Highly flammable liquid and vapour Harmful if swallowed May be harmful in contact with skin Toxic if inhaled Causes skin and eye irritation Suspected of causing cancer Causes damage to lungs, liver and kidneys May cause drowsiness or dizziness May cause damage to liver and kidneys through prolonged or repeated exposure Harmful to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Subsidiary Risks: 6.1; UN Pack Group: II</p>
STORAGE	
Fireproof. Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Cool. Dry. Well closed. Store in an area without drain or sewer access.	
PACKAGING	
Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with
the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

1,2-DICHLOROETHANE**ICSC: 0250****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS VISCOUS LIQUID WITH CHARACTERISTIC ODOUR. TURNS DARK ON EXPOSURE TO AIR, MOISTURE AND LIGHT.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Decomposes on heating and on burning. This produces toxic and corrosive fumes including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Reacts with alkali metals, powdered metals, ammonia, bases and strong oxidants. This generates fire and explosion hazard. Attacks many metals in the presence of water.

Formula: $\text{ClCH}_2\text{CH}_2\text{Cl}$ / $\text{C}_2\text{H}_4\text{Cl}_2$

Molecular mass: 98.96

Boiling point: 83.5°C

Melting point: -35.7°C

Relative density (water = 1): 1.2

Solubility in water, g/100ml: 0.87

Vapour pressure, kPa at 20°C: 8.7

Relative vapour density (air = 1): 3.42

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2

Flash point: 13°C c.c.

Auto-ignition temperature: 440°C

Explosive limits, vol% in air: 4.2-16

Octanol/water partition coefficient as log Pow: 1.48

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure

The vapour is irritating to the eyes, skin and respiratory tract. Inhalation may cause lung oedema. See Notes. The substance may cause effects on the kidneys and liver. This may result in impaired functions, liver damage and kidney damage. Exposure at high concentrations could cause lowering of consciousness and death. The effects may be delayed.

Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidneys, resulting in impaired functions. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; A4 (not classifiable as a human carcinogen).

MAK: skin absorption (H); carcinogen category: 2.

EU-OEL: 8.2 mg/m³, 2 ppm as TWA; (skin)

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.

ADDITIONAL INFORMATION**EC Classification**

Symbol: F, T; R: 45-11-22-36/37/38; S: 53-45; Note: E

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.


1,2-DICHLOROPROPANE**ICSC: 0441 (June 2015)**

Propylene dichloride

CAS #: 78-87-5**UN #: 1279****EC Number: 201-152-2**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Heating will cause rise in pressure with risk of bursting. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	Use powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Headache. Drowsiness. Dizziness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness. Pain.	Protective gloves.	Rinse and then wash skin with water and soap. Refer for medical attention.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Nausea. Headache. Drowsiness. Abdominal pain. Vomiting. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention. Do NOT induce vomiting.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Remove all ignition sources. Personal protection: self-contained breathing apparatus. Ventilation. Do NOT wash away into sewer. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p>  <p>DANGER</p> <p>Highly flammable liquid and vapour Harmful if swallowed or if inhaled May cause an allergic skin reaction May cause cancer May cause damage to central nervous system May cause damage to liver and kidneys through prolonged or repeated exposure Harmful to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II</p>
STORAGE	
Fireproof. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	
PACKAGING	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

1,2-DICHLOROPROPANE**ICSC: 0441****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers

On combustion, forms toxic and corrosive fumes. Attacks aluminium alloys and some types of plastic. Reacts violently with strong oxidants. This generates fire and explosion hazard.

Formula: $C_3H_6Cl_2$ - $CH_3CHClCH_2Cl$

Molecular mass: 113.0

Boiling point: 96°C

Melting point: -100°C

Relative density (water = 1): 1.16

Solubility in water, g/100ml at 20°C: 0.26

Vapour pressure, kPa at 20°C: 27.9

Relative vapour density (air = 1): 3.9

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.15

Flash point: 16°C c.c.

Auto-ignition temperature: 557°C

Explosive limits, vol% in air: 3.4-14.5

Octanol/water partition coefficient as log Pow: 2.02 (calculated)

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the liver and kidneys. This substance is carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; (DSEN); A4 (not classifiable as a human carcinogen).

MAK: skin absorption (H); carcinogen category: 1

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Do NOT take working clothes home.

ADDITIONAL INFORMATION**EC Classification**

Symbol: F, Xn; R: 11-20/22; S: (2)-16-24

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

DICHLOROTETRAFLUOROETHANE**ICSC: 0649 (November 1998)**1,2-Dichloro-1,1,2,2-tetrafluoroethane
CFC114**CAS #: 76-14-2****UN #: 1958****EC Number: 200-937-7**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Heating will cause rise in pressure with risk of bursting. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Suffocation. See Notes.	Use ventilation.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .
Eyes	See Skin.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion			

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Ventilation. NEVER direct water jet on liquid. Do NOT let this chemical enter the environment. Personal protection: chemical protection suit including self-contained breathing apparatus.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 2.2
STORAGE	
Fireproof if in building. Cool.	
PACKAGING	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

DICHLOROTETRAFLUOROETHANE**ICSC: 0649****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS COMPRESSED LIQUEFIED GAS.

Physical dangers

The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases including hydrogen chloride and hydrogen fluoride.

Formula: C₂Cl₂F₄ / ClF₂C-CClF₂

Molecular mass: 170.92

Boiling point: 4.1°C

Melting point: -94°C

Relative density (water = 1): 1.5

Solubility in water at 25°C: none

Vapour pressure, kPa at 25°C: 268

Relative vapour density (air = 1): 5.89

Octanol/water partition coefficient as log Pow: 2.8

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation.

Effects of short-term exposure

Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the cardiovascular system. This may result in cardiac disorders.

Inhalation risk

A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS**

TLV: 1000 ppm as TWA; A4 (not classifiable as a human carcinogen).

MAK: 7100 mg/m³, 1000 ppm; peak limitation category: II(8); pregnancy risk group: D**ENVIRONMENT**

Avoid release to the environment because of its impact on the ozone layer.

NOTES

High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death.

Check oxygen content before entering area.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,3,5-TRIMETHYLBENZENE**ICSC: 1155 (June 2002)**

Mesitylene

CAS #: 108-67-8**UN #: 2325****EC Number: 203-604-4**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 50°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 50°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use alcohol-resistant foam, dry powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Confusion. Cough. Dizziness. Drowsiness. Headache. Sore throat. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III
STORAGE	
Fireproof. Separated from strong oxidants. Well closed. Keep in a well-ventilated room.	
PACKAGING	
Marine pollutant.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

1,3,5-TRIMETHYLBENZENE**ICSC: 1155****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces toxic and irritating fumes.
 Reacts violently with strong oxidants. This generates fire and explosion hazard.

Formula: C₉H₁₂

Molecular mass: 120.2

Boiling point: 165°C

Melting point: -45°C

Relative density (water = 1): 0.86

Solubility in water: very poor

Vapour pressure, kPa at 20°C: 0.25

Relative vapour density (air = 1): 4.1

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01

Flash point: 50°C c.c.

Auto-ignition temperature: 550°C

Octanol/water partition coefficient as log Pow: 3.42

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. Repeated or prolonged inhalation may cause effects on the lungs. This may result in chronic bronchitis. The substance may have effects on the central nervous system and blood. See Notes.

OCCUPATIONAL EXPOSURE LIMITSEU-OEL: 100 mg/m³, 20 ppm as TWA.MAK: 100 mg/m³, 20 ppm; peak limitation category: II(2); pregnancy risk group: C**ENVIRONMENT**

The substance is harmful to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

Use of alcoholic beverages enhances the harmful effect.

Depending on the degree of exposure, periodic medical examination is suggested.

See ICSCs 1362, 1389 and 1433.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xi, N; R: 10-37-51/53; S: (2)-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,3-BUTADIENE**ICSC: 0017 (April 2017)**


Divinyl
Vinylethylene
Biethylene
Erythrene
Pyrrolylene
Buta-1,3-diene

CAS #: 106-99-0**UN #: 1010 (stabilized)****EC Number: 203-450-8**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Extremely flammable. Gas/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding) if in liquid state.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with water spray, powder, carbon dioxide, foam. In case of fire: keep cylinder cool by spraying with water.

AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Headache. Drowsiness.	Use closed system and ventilation.	Fresh air, rest. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention.
Eyes	ON CONTACT WITH LIQUID: FROSTBITE.	Wear face shield.	ON FROSTBITE: rinse with plenty of water. Refer immediately for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Remove all ignition sources. Evacuate danger area! Consult an expert! Personal protection: self-contained breathing apparatus. Shut off cylinder if possible. Isolate the area until the gas has dispersed. NEVER direct water jet on liquid.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  </div> <p>DANGER</p> <p>Contains gas under pressure; may explode if heated Extremely flammable gas May cause cancer May cause genetic defects</p> <p>Transportation UN Classification UN Hazard Class: 2.1</p>
STORAGE	
Store only if stabilized. Fireproof. Cool. Keep in a well-ventilated room. Separated from incompatible materials and food and feedstuffs. See Chemical Dangers. See Physical Dangers. Refer to the manufacturer's instructions for proper storage conditions.	
PACKAGING	
Do not transport with food and feedstuffs. Transport only if stabilized.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



1,3-BUTADIENE**ICSC: 0017****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS COMPRESSED LIQUEFIED GAS WITH CHARACTERISTIC ODOUR.

Physical dangers

The gas is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated. Vapours are uninhibited and may polymerize, causing blockage of vents.

Chemical dangers

The substance can form peroxides on exposure to air, initiating explosive polymerization. The substance may polymerize due to warming. This generates fire or explosion hazard. Decomposes explosively on rapid heating under pressure. Reacts vigorously with oxidants and many other substances. This generates fire and explosion hazard. Attacks many plastics and some forms of rubber.

Formula: C_4H_6 / $CH_2=(CH)_2=CH_2$

Molecular mass: 54.1

Boiling point: -4°C

Melting point: -109°C

Relative density (water = 1): 0.6

Solubility in water, g/100ml: 0.1 (none)

Vapour pressure, kPa at 20°C: 245

Relative vapour density (air = 1): 1.9

Flash point: -76°C c.c.

Auto-ignition temperature: 414°C

Explosive limits, vol% in air: 1.1-16.3

Octanol/water partition coefficient as log Pow: 1.99

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation.

Effects of short-term exposure

The substance at very high concentrations is irritating to the eyes and respiratory tract. Rapid evaporation of the liquid may cause frostbite. Inhalation of high concentrations may cause depression of the central nervous system.

Inhalation risk

A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

Effects of long-term or repeated exposure

The substance may have effects on the bone marrow. This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 2 ppm as TWA; A2 (suspected human carcinogen).

EU-OEL: 2.2 mg/m³, 1 ppm as TWA.

MAK: carcinogen category: 1; germ cell mutagen group: 2

ENVIRONMENT

Environmental effects from the substance have not been investigated adequately.

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.
Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

ADDITIONAL INFORMATION**EC Classification**

Symbol: F+, T; R: 45-46-12; S: 53-45; Note: D

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,3-DICHLOROBENZENE**ICSC: 1095 (April 2000)**m-Dichlorobenzene
m-Phenylene dichloride**CAS #: 541-73-1****UN #: 2810****EC Number: 208-792-1**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 63°C explosive vapour/air mixtures may be formed.	NO open flames. Above 63°C use a closed system and ventilation.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Drowsiness. Nausea. Sore throat. Vomiting. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Provision to contain effluent from fire extinguishing. Separated from strong oxidants, aluminium and food and feedstuffs. Well closed. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

1,3-DICHLOROBENZENE**ICSC: 1095****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID.

Physical dangers

The vapour is heavier than air.

Chemical dangers

Decomposes on burning. This produces toxic fumes including hydrogen chloride. Reacts with strong oxidants. Reacts violently with aluminium.

Formula: C₆H₄Cl₂

Molecular mass: 147.00

Boiling point: 173°C

Melting point: -24.8°C

Relative density (water = 1): 1.288

Solubility in water: none

Vapour pressure, kPa at 25°C: 0.286

Relative vapour density (air = 1): 5.1

Flash point: 63°C

Octanol/water partition coefficient as log Pow: 3.53

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

The vapour is irritating to the eyes, skin and respiratory tract. See Notes.

Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

The substance may have effects on the kidneys and liver. See Notes.

OCCUPATIONAL EXPOSURE LIMITSMAK: 12 mg/m³, 2 ppm; peak limitation category: II(2); pregnancy risk group: C**ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTESData on the toxicity of m-dichlorobenzene are limited.
See ICSCs 0037 and 1066.**ADDITIONAL INFORMATION****EC Classification**


Symbol: Xn, N; R: 22-51/53; S: (2)-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,4-DICHLOROBENZENE**ICSC: 0037 (May 2018)**p-Dichlorobenzene
PDCB**CAS #: 106-46-7****UN #: 3077****EC Number: 203-400-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 66°C explosive vapour/air mixtures may be formed. Finely dispersed particles form explosive mixtures in air.	NO open flames. Above 66°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Drowsiness. Headache. Nausea. Shortness of breath. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Diarrhoea. Further see Inhalation.	Do not eat, drink, or smoke during work.	Give one or two glasses of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>WARNING</p> </div> <p>Harmful if swallowed Causes serious eye irritation Suspected of causing cancer Very toxic to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III</p>
STORAGE	
Separated from strong oxidants and food and feedstuffs. Provision to contain effluent from fire extinguishing. Keep in a well-ventilated room. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	



World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European Commission

1,4-DICHLOROBENZENE**ICSC: 0037****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS-TO-WHITE CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

On combustion, forms toxic and corrosive fumes including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Upon heating, toxic fumes are formed. Reacts with strong oxidants. This generates fire and explosion hazard.

Formula: C₆H₄Cl₂

Molecular mass: 147

Boiling point: 174°C

Melting point: 53°C

Density: 1.2 g/cm³

Solubility in water, mg/l at 20°C: 49 (practically insoluble)

Vapour pressure, Pa at 20°C: 170

Relative vapour density (air = 1): 5.08

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01

Flash point: 66°C c.c.

Explosive limits, vol% in air: 1.7-5.9

Octanol/water partition coefficient as log Pow: 3.37

Auto-ignition temperature: 640°C

Viscosity: 0.73 mPa*s at 70°C

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, respiratory tract and skin. The substance may cause effects on the blood. This may result in haemolytic anaemia. The substance may cause effects on the central nervous system.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance may have effects on the liver, central nervous system, blood and lungs. This may result in liver function impairment, neuropathy and anaemia. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 12 mg/m³, 2 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.

EU-OEL: 12 mg/m³, 2 ppm as TWA; 60 mg/m³, 10 ppm as STEL; (skin)

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

Do NOT take working clothes home.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn, N; R: 36-40-50/53; S: (2)-36/37-46-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,4-DIOXANE**ICSC: 0041 (November 2008)**


1,4-Diethylene dioxide
Dioxane
para-Dioxane

CAS #: 123-91-1**UN #: 1165****EC Number: 204-661-8**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive. Risk of fire and explosion on contact with incompatible substances. See Chemical Dangers.	NO open flames, NO sparks and NO smoking. NO contact with strong oxidizing agents. NO contact with hot surfaces. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	Use powder, alcohol-resistant foam, water spray, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Nausea. Dizziness. Headache. Drowsiness. Vomiting. Unconsciousness. Abdominal pain.	Use ventilation (not if powder), local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible).
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Seek medical attention if you feel unwell.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking liquid in sealable air tight containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.	<p>According to UN GHS Criteria</p>  <p>DANGER</p> <p>Highly flammable liquid and vapour Causes eye irritation May cause respiratory irritation Suspected of causing cancer May be harmful if swallowed and enters airways</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II</p>
STORAGE	
Fireproof. Separated from strong oxidants, strong acids and incompatible materials. Cool. Dry. Well closed. Keep in the dark. Store only if stabilized. Store in an area without drain or sewer access.	
PACKAGING	
Airtight.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



1,4-DIOXANE**ICSC: 0041****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers

The substance can form explosive peroxides on exposure to air. Reacts with oxidants and strong acids. Reacts violently with some catalysts.

Formula: C₄H₈O₂

Molecular mass: 88.1

Boiling point: 101°C

Melting point: 12°C

Relative density (water = 1): 1.03

Solubility in water: miscible

Vapour pressure, kPa at 20°C: 3.9

Relative vapour density (air = 1): 3.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.08

Flash point: 12°C c.c.

Auto-ignition temperature: 180°C

Explosive limits, vol% in air: 2-22.0

Octanol/water partition coefficient as log Pow: -0.27

Viscosity: 1.17 mm²/s at 25°C**EXPOSURE & HEALTH EFFECTS****Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour and through the skin.

Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis. Exposure at high levels could cause lowering of consciousness.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C, on spraying or dispersing much faster.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system, kidneys and liver. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 37 mg/m³, 10 ppm; peak limitation category: I(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.EU-OEL: 73 mg/m³, 20 ppm as TWA**ENVIRONMENT****NOTES**

Refer for medical attention if breathing difficulties and/or fever develop.

Check for peroxides prior to distillation; eliminate if found.

ADDITIONAL INFORMATION**EC Classification**

Symbol: F, Xn; R: 11-19-36/37-40-66; S: (2)-9-16-36/37-46; Note: D

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

2-HEXANONE**ICSC: 0489 (November 1998)**

Methyl n-butyl ketone
n-Butyl methyl ketone
MBK

CAS #: 591-78-6**UN #: 1224****EC Number: 209-731-1**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 23°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 23°C use a closed system, ventilation and explosion-proof electrical equipment.	Use alcohol-resistant foam, powder, carbon dioxide. In case of fire: keep cylinder cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Drowsiness. Headache. Nausea. Sore throat.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain. Blurred vision.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Sore throat. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: self-contained breathing apparatus. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III
STORAGE	
Fireproof. Separated from strong oxidants.	
PACKAGING	
Note: 6	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

2-HEXANONE**ICSC: 0489****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Reacts violently with oxidants. This generates fire and explosion hazard.
Attacks plastics.

Formula: $C_6H_{12}O$ / $C_4H_9COCH_3$

Molecular mass: 100.2

Boiling point: 126-128°C

Melting point: -57°C

Relative density (water = 1): 0.8

Solubility in water, g/100ml at 20°C: 1.4

Vapour pressure, kPa at 20°C: 0.36

Relative vapour density (air = 1): 3.5

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01

Flash point: 23°C c.c.

Auto-ignition temperature: 423°C

Explosive limits, vol% in air: 1.2-8.0

Octanol/water partition coefficient as log Pow: 1.38

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and through the skin.

Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. The substance may cause effects on the nervous system. Exposure far above the OEL could cause unconsciousness.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C, on spraying or dispersing much faster.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the nervous system.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as TWA; 10 ppm as STEL; (skin).

MAK: 21 mg/m³, 5 ppm; peak limitation category: II(8); skin absorption (H)**ENVIRONMENT****NOTES**

Use of alcoholic beverages enhances the harmful effect.

MBK potentiates the toxicity of some other chemical substances like chloroform, carbon tetrachloride, ethanol.

Depending on the degree of exposure, periodic medical examination is suggested.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T; R: 10-48/23-62-67; S: (1/2)-36/37-45

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

Material Safety Data Sheet

p-Ethyltoluene, 98%

ACC# 35092

Section 1 - Chemical Product and Company Identification

MSDS Name: p-Ethyltoluene, 98%**Catalog Numbers:** AC119010000, AC119010050, AC119010100, AC119010250, AC119010500**Synonyms:** 4-Ethyltoluene; 1-Ethyl-4-methylbenzene; 1-Methyl-4-ethylbenzene; p-Ethyltoluene.**Company Identification:**

Acros Organics N.V.

One Reagent Lane

Fair Lawn, NJ 07410

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

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
622-96-8	p-Ethyltoluene	98	210-761-2

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear very slight yellow liquid. Flash Point: 36 deg C.**Warning! Flammable liquid and vapor.** May cause eye and skin irritation. May cause respiratory tract irritation. May cause central nervous system depression. May cause lung damage. The toxicological properties of this material have not been fully investigated.**Target Organs:** Central nervous system, lungs.

Potential Health Effects

Eye: May cause chemical conjunctivitis and corneal damage.**Skin:** May be harmful if absorbed through the skin. May cause irritation and dermatitis. May cause cyanosis of the extremities.**Ingestion:** Aspiration hazard. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Ingestion of large amounts may cause CNS depression. May cause lung damage.**Inhalation:** May cause respiratory tract irritation. Aspiration may lead to pulmonary edema. May be harmful if inhaled. Vapors may cause dizziness or suffocation. May cause burning sensation in the chest.**Chronic:** Effects may be delayed.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.**Skin:** Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.**Ingestion:** Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.

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

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water. Flammable liquid and vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Water may be ineffective. Do NOT use straight streams of water.

Flash Point: 36 deg C (96.80 deg F)

Autoignition Temperature: 475 deg C (887.00 deg F)

Explosion Limits, Lower:Not available.

Upper: Not available.

NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

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

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapor or mist.

Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
p-Ethyltoluene	none listed	none listed	none listed

OSHA Vacated PELs: p-Ethyltoluene: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

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

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

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

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: clear very slight yellow

Odor: Toluene-like

pH: Not available.

Vapor Pressure: 3 mm Hg @ 25 deg C

Vapor Density: 4.15 (air=1)

Evaporation Rate: Not available.

Viscosity: Not available.

Boiling Point: 162 deg C @ 760 mm Hg

Freezing/Melting Point: -62 deg C

Decomposition Temperature: Not available.

Solubility: Insoluble.

Specific Gravity/Density: .8600 g/cm³

Molecular Formula: C₉H₁₂

Molecular Weight: 120.19

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Ignition sources, excess heat.

Incompatibilities with Other Materials: Strong oxidizing agents.

Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.

Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:

CAS# 622-96-8: XT2550000

LD50/LC50:

CAS# 622-96-8:

Inhalation, mouse: LC50 = 54000 mg/m³/4H;

Oral, rat: LD50 = 4850 mg/kg;

Carcinogenicity:

CAS# 622-96-8: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found

Teratogenicity: No information found

Reproductive Effects: See actual entry in RTECS for complete information.

Mutagenicity: See actual entry in RTECS for complete information.

Neurotoxicity: No information found**Other Studies:**

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

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

RCRA P-Series: None listed.**RCRA U-Series:** None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	FLAMMABLE LIQUIDS, N.O.S.	FLAMMABLE LIQUID NOS (P-ETHYLTOLUENE)
Hazard Class:	3	3
UN Number:	UN1993	UN1993
Packing Group:	III	III
Additional Info:		FP 36 C

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 622-96-8 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 622-96-8: Effective 4/29/83, Sunset 4/29/93

Chemical Test Rules

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

Section 12b

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

TSCA Significant New Use Rule

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

CERCLA Hazardous Substances and corresponding RQs

None of the chemicals in this material have an RQ.

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

Section 313

No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

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

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

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

OSHA:

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

STATE

CAS# 622-96-8 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations**European Labeling in Accordance with EC Directives****Hazard Symbols:**

XN

Risk Phrases:

R 10 Flammable.

R 65 Harmful: may cause lung damage if swallowed.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.

WGK (Water Danger/Protection)

CAS# 622-96-8: No information available.

Canada - DSL/NDSL

CAS# 622-96-8 is listed on Canada's NDSL List.

Canada - WHMIS

This product has a WHMIS classification of B2.

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

Canadian Ingredient Disclosure List

CAS# 622-96-8 is not listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information
--

MSDS Creation Date: 9/02/1997

Revision #8 Date: 9/26/2007

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

p-CYMENE**ICSC: 0617 (November 1997)**

1-Methyl-4-isopropylbenzene

Dolcymene

Camphogen

CAS #: 99-87-6**UN #: 2046****EC Number: 202-796-7**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 47°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 47°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Vomiting.	Use ventilation.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Wear protective gloves when administering first aid.
Eyes	Redness.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Diarrhoea. Drowsiness. Headache. Nausea. Vomiting. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III
STORAGE	
Fireproof.	
PACKAGING	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

© ILO and WHO 2021

European
Commission

p-CYMENE**ICSC: 0617****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air.

Chemical dangers

Reacts with oxidants. Attacks rubber.

Formula: C₁₀H₁₄ / CH₃C₆H₄CH(CH₃)₂

Molecular mass: 134.2

Boiling point: 177°C

Melting point: -68°C

Relative density (water = 1): 0.85

Solubility in water, g/100ml at 25°C: 0.002

Vapour pressure, Pa at 20°C: 200

Relative vapour density (air = 1): 4.62

Flash point: 47°C c.c.

Auto-ignition temperature: 435°C

Explosive limits, vol% in air: 0.7-5.6

Octanol/water partition coefficient as log Pow: 4.1

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes and skin. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT****NOTES****ADDITIONAL INFORMATION****EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

METHYL ISOBUTYL KETONE**ICSC: 0511 (July 1997)**

MIBK
4-Methyl-2-pentanone
Isopropylacetone
Hexone

CAS #: 108-10-1**UN #: 1245****EC Number: 203-550-1**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Diarrhoea. Dizziness. Headache. Nausea. Sore throat. Unconsciousness. Vomiting. Weakness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II
STORAGE	
Fireproof. Separated from strong oxidants. Well closed.	
PACKAGING	
Airtight.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

METHYL ISOBUTYL KETONE**ICSC: 0511****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour mixes well with air, explosive mixtures are easily formed.

Chemical dangers

The substance can form explosive peroxides on exposure to air. Reacts violently with strong oxidants and strong reducing agents.

Formula: $C_6H_{12}O$ / $CH_3COCH_2CH(CH_3)_2$

Molecular mass: 100.2

Boiling point: 117-118°C

Melting point: -84.7°C

Relative density (water = 1): 0.80

Solubility in water, g/100ml at 20°C: 1.91

Vapour pressure, kPa at 20°C: 2.1

Relative vapour density (air = 1): 3.45

Flash point: 14°C c.c.

Auto-ignition temperature: 460°C

Explosive limits, vol% in air: 1.4-7.5

Octanol/water partition coefficient as log Pow: 1.38

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure

The substance and the vapour are irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system at high concentrations. This may result in narcosis.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 ppm as TWA; 75 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.

MAK: 83 mg/m³, 20 ppm; peak limitation category: I(2); skin absorption (H); pregnancy risk group: C.EU-OEL: 83 mg/m³, 20 ppm as TWA; 208 mg/m³, 50 ppm as STEL**ENVIRONMENT****NOTES**

Check for peroxides prior to distillation; eliminate if found.

ADDITIONAL INFORMATION**EC Classification**

Symbol: F, Xn; R: 11-20-36/37-66; S: (2)-9-16-29; Note: 6

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.


ACETONE**ICSC: 0087 (April 2009)**

2-Propanone
Dimethyl ketone
Methyl ketone

CAS #: 67-64-1**UN #: 1090****EC Number: 200-662-2**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive. Heating will cause rise in pressure with risk of bursting.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	Use powder, alcohol-resistant foam, water, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Confusion. Headache. Dizziness. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain. Blurred vision.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.
Ingestion	Nausea. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Remove all ignition sources. Personal protection: filter respirator for organic gases and vapours of low boiling point adapted to the airborne concentration of the substance. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.	<p>According to UN GHS Criteria</p> <div>  </div> <p>DANGER</p> <p>Highly flammable liquid and vapour Causes eye irritation</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II</p>
STORAGE	
Fireproof. Separated from : see Chemical Dangers. Store in an area without drain or sewer access.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

ACETONE

ICSC: 0087

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers

Contact with strong oxidants such as acetic acid, nitric acid and hydrogen peroxide generates explosive peroxides. Reacts with chloroform and bromoform under basic conditions. This generates fire and explosion hazard. Attacks plastics.

Formula: C_3H_6O / $CH_3-CO-CH_3$

Molecular mass: 58.1

Boiling point: 56°C

Melting point: -95°C

Relative density (water = 1): 0.8

Solubility in water: miscible

Vapour pressure, kPa at 20°C: 24

Relative vapour density (air = 1): 2.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2

Flash point: -18°C c.c.

Auto-ignition temperature: 465°C

Explosive limits, vol% in air: 2.2-13

Octanol/water partition coefficient as log Pow: -0.24

Viscosity: 0.34 mm²/s at 40°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation.

Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. Exposure at high levels could cause lowering of consciousness.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C, on spraying or dispersing much faster.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. Repeated or prolonged contact with skin may cause dryness and cracking.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 250 ppm as TWA; 500 ppm as STEL; BEI issued; A4 (not classifiable as a human carcinogen).

MAK: 1200 mg/m³, 500 ppm; peak limitation category: I(2); pregnancy risk group: B.EU-OEL: 1210 mg/m³, 500 ppm as TWA

ENVIRONMENT

NOTES

Use of alcoholic beverages enhances the harmful effect.

ADDITIONAL INFORMATION

EC Classification

Symbol: F, Xi; R: 11-36-66-67; S: (2)-9-16-26

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

ACRYLONITRILE**ICSC: 0092 (March 2001)**

Cyanoethylene
2-Propenenitrile
Vinyl cyanide

CAS #: 107-13-1**UN #: 1093****EC Number: 203-466-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive. Risk of fire and explosion on contact with strong bases or strong acids.	NO open flames, NO sparks and NO smoking. NO contact with strong bases or strong acids. Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking handtools.	Use water spray, powder, alcohol-resistant foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Headache. Nausea. Shortness of breath. Vomiting. Weakness. Convulsions. Chest tightness.	Use closed system or ventilation.	Fresh air, rest. Refer for medical attention. See Notes.
Skin	MAY BE ABSORBED! Redness. Pain. Blisters. Further see Inhalation.	Protective gloves. Protective clothing.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Ventilation. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 3; UN Subsidiary Risks: 6.1; UN Pack Group: I
STORAGE	
Fireproof. Separated from strong oxidants, strong bases and food and feedstuffs. Cool. Keep in the dark. Ventilation along the floor. Store only if stabilized.	
PACKAGING	
Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

ACRYLONITRILE

ICSC: 0092

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS OR PALE YELLOW LIQUID WITH PUNGENT ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers

The substance polymerizes due to heating and under the influence of light and bases. This generates fire or explosion hazard. Decomposes on heating. This produces toxic fumes including hydrogen cyanide and nitrogen oxides. Reacts violently with strong acids and strong oxidants. Attacks plastics and rubber.

Formula: C_3H_3N / $CH_2=CH-CN$

Molecular mass: 53.1

Boiling point: 77°C

Melting point: -84°C

Relative density (water = 1): 0.8

Solubility in water, g/100ml at 20°C: 7

Vapour pressure, kPa at 20°C: 11.0

Relative vapour density (air = 1): 1.8

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.05

Flash point: -1°C c.c.

Auto-ignition temperature: 481°C

Explosive limits, vol% in air: 3.0-17.0

Octanol/water partition coefficient as log Pow: 0.25

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure

The substance and the vapour are irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause death. The effects may be delayed. See Notes. Medical observation is indicated.

Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. The substance may have effects on the central nervous system and liver. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 2 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: carcinogen category: 2; sensitization of skin (SH); skin absorption (H)

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

Exposure to the substance will result in cyanide formation.

See ICSC 0671.

Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.

The odour warning when the exposure limit value is exceeded is insufficient.

Rinse contaminated clothing with plenty of water because of fire hazard.

ADDITIONAL INFORMATION

EC Classification


Symbol: F, T, N; R: 45-11-23/24/25-37/38-41-43-51/53; S: 9-16-53-45-61; Note: D, E

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

BENZENE**ICSC: 0015 (November 2016)**Cyclohexatriene
Benzol**CAS #: 71-43-2****UN #: 1114****EC Number: 200-753-7**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive. Risk of fire and explosion. See Chemical Dangers.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools. Prevent build-up of electrostatic charges (e.g., by grounding).	Use foam, water spray, carbon dioxide, powder. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Shortness of breath. Convulsions. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Dry skin. Redness. Pain. Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Sore throat. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Remove all ignition sources. Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p>  <p>DANGER</p> <p>Highly flammable liquid and vapour May be fatal if swallowed and enters airways Causes skin irritation Causes serious eye irritation May cause genetic defects May cause cancer Causes damage to the bone marrow and the central nervous system through prolonged or repeated exposure Harmful to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II</p>
STORAGE	
Fireproof. Separated from food and feedstuffs, oxidants and halogens. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

BENZENE**ICSC: 0015****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Reacts violently with oxidants, nitric acid, sulfuric acid and halogens. This generates fire and explosion hazard. Attacks plastics and rubber.

Formula: C₆H₆

Molecular mass: 78.1

Boiling point: 80°C

Melting point: 6°C

Relative density (water = 1): 0.88

Solubility in water, g/100ml at 25°C: 0.18

Vapour pressure, kPa at 20°C: 10

Relative vapour density (air = 1): 2.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2

Flash point: -11°C c.c.

Auto-ignition temperature: 498°C

Explosive limits, vol% in air: 1.2-8.0

Octanol/water partition coefficient as log Pow: 2.13

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. Exposure far above the OEL could cause unconsciousness and death. If swallowed the substance easily enters the airways and could result in aspiration pneumonitis.

Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system and immune system. The substance may have effects on the bone marrow. This may result in anaemia. This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.5 ppm as TWA; 2.5 ppm as STEL; (skin); A1 (confirmed human carcinogen); BEI issued.

EU-OEL: 3.25 mg/m³, 1 ppm as TWA; (skin).

MAK: carcinogen category: 1; germ cell mutagen group: 3A; skin absorption (H)

ENVIRONMENT

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Use of alcoholic beverages enhances the harmful effect.

Depending on the degree of exposure, periodic medical examination is suggested.

The odour warning when the exposure limit value is exceeded is insufficient.

Benzene causes acute myeloid leukaemia/acute non-lymphocytic leukaemia. Also, a positive association has been observed between exposure to benzene and acute lymphocytic leukaemia, chronic lymphocytic leukaemia, multiple myeloma, and non-Hodgkin lymphoma.

ADDITIONAL INFORMATION**EC Classification**

Symbol: F, T; R: 45-46-11-36/38-48/23/24/25-65; S: 53-45; Note: E

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

BENZYL CHLORIDE**ICSC: 0016 (October 2001)**

alpha-Chlorotoluene
(Chloromethyl)benzene
Tolyl chloride

CAS #: 100-44-7**UN #: 1738****EC Number: 202-853-6**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 67°C explosive vapour/air mixtures may be formed.	NO open flames. Above 67°C use a closed system and ventilation.	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Burning sensation. Cough. Nausea. Headache. Shortness of breath. Dizziness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Watering of the eyes. Redness. Pain. Blurred vision. Severe deep burns.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Vomiting. Burning sensation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered non-metallic containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Subsidiary Risks: 8; UN Pack Group: II
STORAGE	
Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Dry. Ventilation along the floor. Store only if stabilized.	
PACKAGING	
Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

BENZYL CHLORIDE**ICSC: 0016****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH PUNGENT ODOUR.

Physical dangers**Chemical dangers**

The substance polymerizes under the influence of all common metals except nickel and lead. This produces corrosive fumes (hydrogen chloride - see ICSC 0163). This generates fire or explosion hazard. On combustion, forms toxic and corrosive fumes of hydrogen chloride. Reacts vigorously with strong oxidants. Attacks many metals in the presence of water.

Formula: C₇H₇Cl / C₆H₅CH₂Cl

Molecular mass: 126.6

Boiling point: 179°C

Melting point: ~-43°C

Relative density (water = 1): 1.1

Solubility in water, g/100ml: <0.1 (none)

Vapour pressure, Pa at 20°C: 120

Relative vapour density (air = 1): 4.4

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 67°C c.c.

Auto-ignition temperature: 585°C

Explosive limits, vol% in air: 1.1-14.0

Octanol/water partition coefficient as log Pow: 2.3

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is corrosive to the eyes. The vapour is irritating to the eyes, skin and respiratory tract. Inhalation of the vapour or aerosol may cause lung oedema. See Notes. The substance may cause effects on the central nervous system. This may result in unconsciousness.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C, on spraying much faster.

Effects of long-term or repeated exposure

The substance may have effects on the liver and kidneys. This may result in tissue lesions. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

MAK: skin absorption (H); carcinogen category: 2

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.

Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered.

An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T; R: 45-22-23-37/38-41-48/22; S: 53-45; Note: E

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

BROMODICHLOROMETHANE

ICSC: 0393 (April 2006)


Dichlorobromomethane
Methane, bromodichloro-

CAS #: 75-27-4

EC Number: 200-856-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Effects of long-term or repeated exposure.	Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
	According to UN GHS Criteria
STORAGE	 <p>WARNING</p> <p>Harmful if swallowed Suspected of causing cancer May cause damage to liver and kidneys through prolonged or repeated exposure if swallowed</p>
Separated from strong oxidants, strong bases and magnesium. Ventilation along the floor.	
PACKAGING	
	Transportation UN Classification



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



BROMODICHLOROMETHANE**ICSC: 0393****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID.

Physical dangers

The vapour is heavier than air.

Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases including hydrogen bromide and hydrogen chloride. Reacts with strong bases, strong oxidants and magnesium.

Formula: CHBrCl_2

Molecular mass: 163.8

Boiling point: 90°C

Melting point: -57°C

Density: 1.9 g/cm³

Solubility in water, g/100ml at 20°C: 0.45 (poor)

Vapour pressure, kPa at 20°C: 6.6

Relative vapour density (air = 1): 5.6

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.3

Octanol/water partition coefficient as log Pow: 2

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by ingestion.

Effects of short-term exposure**Inhalation risk**

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Ingestion may cause effects on the kidneys and liver. This may result in impaired functions. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

MAK: skin absorption (H); carcinogen category: 2; germ cell mutagen group: 3B

ENVIRONMENT**NOTES**

Bromodichloromethane can be found in chlorinated water.

Health effects of exposure to the substance have not been investigated adequately other than by ingestion.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.


BROMOFORM**ICSC: 0108 (April 2009)**

Tribromomethane
Methenyl tribromide
Methyl tribromide

CAS #: 75-25-2**UN #: 2515****EC Number: 200-854-6**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Further see Ingestion.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Redness. See Ingestion.	Protective gloves. Protective clothing.	Rinse and then wash skin with water and soap. Seek medical attention if you feel unwell.
Eyes	Watering of the eyes. Redness. Pain.	Wear safety spectacles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Headache. Dizziness. Drowsiness.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>WARNING</p> </div> <p>Harmful if swallowed Causes skin and eye irritation May cause respiratory irritation May cause damage to the nervous system and liver May cause damage to liver through prolonged or repeated exposure Harmful to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III</p>
STORAGE	
Separated from strong bases, oxidants, metals and food and feedstuffs. Keep in the dark. Ventilation along the floor. Store only if stabilized. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

BROMOFORM**ICSC: 0108****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR. TURNS YELLOW ON EXPOSURE TO LIGHT AND AIR.

Physical dangers

No data.

Chemical dangers

Decomposes on heating. This produces toxic and corrosive fumes including hydrogen bromide and bromine. Reacts violently with oxidants and bases. Reacts with powdered metals. This generates fire and explosion hazard. Attacks some forms of plastic, rubber and coatings.

Formula: CHBr_3

Molecular mass: 252.7

Boiling point: 149.5°C

Melting point: 8.3°C

Relative density (water = 1): 2.9

Solubility in water, g/100ml at 20°C: 0.1 (poor)

Vapour pressure, kPa at 20°C: 0.67

Relative vapour density (air = 1): 8.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.05

Octanol/water partition coefficient as log Pow: 2.38

Viscosity: 0.74 mm²/s at 15°C

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system.

Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance may have effects on the liver and kidneys.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.5 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: carcinogen category: 3

ENVIRONMENT

The substance is harmful to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 22-23-36/38-51/53; S: (1/2)-28-45-61-63

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

CARBON DISULFIDE**ICSC: 0022 (April 2000)**

Carbon bisulfide
Carbon sulfide
Carbon disulphide

CAS #: 75-15-0**UN #: 1131****EC Number: 200-843-6**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Many reactions may cause fire or explosion. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. NO contact with hot surfaces. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Do NOT expose to friction or shock.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Headache. Nausea. Shortness of breath. Vomiting. Weakness. Irritability. Hallucinations.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Dry skin. Redness. Further see Inhalation.	Protective gloves. Protective clothing.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Further see Inhalation.	Do not eat, drink, or smoke during work.	Give nothing to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Remove all ignition sources. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 3; UN Subsidiary Risks: 6.1; UN Pack Group: I
STORAGE	
Fireproof. Separated from oxidants and food and feedstuffs. Cool. Store in an area without drain or sewer access.	
PACKAGING	
Airtight. Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

CARBON DISULFIDE**ICSC: 0022****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

May decompose explosively on shock, friction or concussion. May explode on heating. The substance may ignite spontaneously on contact with hot surfaces and air. This produces toxic fumes of sulfur dioxide (see ICSC 0074). Reacts violently with oxidants. This generates fire and explosion hazard. Attacks some forms of plastic, rubber and coatings.

Formula: CS₂

Molecular mass: 76.1

Boiling point: 46°C

Melting point: -111°C

Relative density (water = 1): 1.26

Solubility in water, g/100ml at 20°C: 0.2

Vapour pressure, kPa at 25°C: 48

Relative vapour density (air = 1): 2.63

Flash point: -30°C c.c.

Auto-ignition temperature: 90°C

Explosive limits, vol% in air: 1-50

Octanol/water partition coefficient as log Pow: 1.84

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure could cause lowering of consciousness. Exposure between 200 and 500 ppm could cause death.

Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the cardiovascular system and nervous system. This may result in coronary heart disease, severe neurobehavioural effects, polyneuritis and psychoses. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1 ppm as TWA; (skin); A4 (not classifiable as a human carcinogen); BEI issued.

MAK: 16 mg/m³, 5 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: B.

EU-OEL: 15 mg/m³, 5 ppm as TWA; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

ADDITIONAL INFORMATION**EC Classification**

Symbol: F, T; R: 11-36/38-48/23-62-63; S: (1/2)-16-33-36/37-45

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

CARBON TETRACHLORIDE**ICSC: 0024 (November 2000)**

Tetrachloromethane
Tetrachlorocarbon
Tetra

CAS #: 56-23-5**UN #: 1846****EC Number: 200-262-8**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II
STORAGE	
Separated from food and feedstuffs and metals. See Chemical Dangers. Ventilation along the floor. Cool.	
PACKAGING	
Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Marine pollutant.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

CARBON TETRACHLORIDE**ICSC: 0024****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air.

Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive fumes of hydrogen chloride (see ICSC 0163), chlorine (see ICSC 0126) and phosgene (see ICSC 0007). Reacts with some metals such as aluminium, magnesium and zinc. This generates fire and explosion hazard.

Formula: CCl₄

Molecular mass: 153.8

Boiling point: 76.5°C

Melting point: -23°C

Relative density (water = 1): 1.59

Solubility in water, g/100ml at 20°C: 0.1 (poor)

Vapour pressure, kPa at 20°C: 12.2

Relative vapour density (air = 1): 5.3

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.5

Octanol/water partition coefficient as log Pow: 2.64

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes. The substance may cause effects on the liver, kidneys and central nervous system. This may result in unconsciousness. Medical observation is indicated.

Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as TWA; 10 ppm as STEL; (skin); A2 (suspected human carcinogen).

MAK: 3.2 mg/m³, 0.5 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.

EU-OEL: 6.4 mg/m³, 1 ppm as TWA; 32 mg/m³, 5 ppm as STEL; (skin)

ENVIRONMENT

The substance is harmful to aquatic organisms. Avoid release to the environment because of its impact on the ozone layer.

NOTES

Use of alcoholic beverages enhances the harmful effect.

Depending on the degree of exposure, periodic medical examination is suggested.

The odour warning when the exposure limit value is exceeded is insufficient.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 23/24/25-40-48/23-52/53-59; S: (1/2)-23-36/37-45-59-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

CHLOROBENZENE**ICSC: 0642 (November 2003)**Benzene chloride
Chlorobenzol
Phenyl chloride**CAS #: 108-90-7****UN #: 1134****EC Number: 203-628-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Gives off irritating or toxic fumes (or gases) in a fire. Above 27°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 27°C use a closed system, ventilation and explosion-proof electrical equipment.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Drowsiness. Headache. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Dry skin.	Protective gloves.	Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Remove all ignition sources. Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III
STORAGE	
Fireproof. Separated from strong oxidants.	
PACKAGING	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

CHLOROBENZENE**ICSC: 0642****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Decomposes on heating and on contact with hot surfaces and flames. This produces toxic and corrosive fumes. Reacts violently with strong oxidants. This generates fire and explosion hazard. Attacks rubber and some plastics.

Formula: C₆H₅Cl

Molecular mass: 112.6

Boiling point: 132°C

Melting point: -45°C

Relative density (water = 1): 1.11

Solubility in water, g/100ml at 20°C: 0.05

Vapour pressure, kPa at 20°C: 1.17

Relative vapour density (air = 1): 3.88

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.03

Flash point: 27°C c.c.

Auto-ignition temperature: 590°C

Explosive limits, vol% in air: 1.3-11

Octanol/water partition coefficient as log Pow: 2.18/2.84

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes and skin. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. This may result in lowering of consciousness.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the liver and kidneys.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.

MAK: 23 mg/m³, 5 ppm; peak limitation category: II(2); pregnancy risk group: C.

EU-OEL: 23 mg/m³, 5 ppm as TWA; 70 mg/m³, 15 ppm as STEL

ENVIRONMENT

The substance is harmful to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn, N; R: 10-20-51/53; S: (2)-24/25-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1-CHLOROETHANE**ICSC: 0132 (October 2000)**Ethyl chloride
Monochloroethane**CAS #: 75-00-3****UN #: 1037****EC Number: 200-830-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Extremely flammable. Gives off irritating or toxic fumes (or gases) in a fire. Gas/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding) if in liquid state. Use non-sparking handtools.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with powder, carbon dioxide. In case of fire: keep cylinder cool by spraying with water.

STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Lethargy. Headache. Abdominal cramps.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves. Protective clothing.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
Eyes	Redness. Pain. Blurred vision.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: self-contained breathing apparatus. Ventilation. Do NOT let this chemical enter the environment.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 2.1
STORAGE	
Fireproof.	
PACKAGING	
Special insulated cylinder. Special fittings.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

1-CHLOROETHANE**ICSC: 0132****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS COMPRESSED LIQUEFIED GAS WITH CHARACTERISTIC ODOUR.

Physical dangers

The gas is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers

Decomposes on heating and on burning. This produces toxic gases of hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007).

Formula: C₂H₅Cl / CH₃CH₂Cl

Molecular mass: 64.5

Boiling point: 12.5°C

Melting point: -138°C

Relative density (water = 1): 0.918

Solubility in water, g/100ml at 20°C: 0.574

Vapour pressure, kPa at 20°C: 133.3

Relative vapour density (air = 1): 2.22

Flash point: -50°C c.c.

Auto-ignition temperature: 519°C

Explosive limits, vol% in air: 3.6-14.8

Octanol/water partition coefficient as log Pow: 1.54

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation.

Effects of short-term exposure

The substance is mildly irritating to the eyes, skin and respiratory tract. Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause unconsciousness, cardiac dysrhythmia and death.

Inhalation risk

A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS**

TLV: 100 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: skin absorption (H); carcinogen category: 3.

EU-OEL: 268 mg/m³, 100 ppm as TWA

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Use of alcoholic beverages enhances the harmful effect.

Rinse contaminated clothing with plenty of water because of fire hazard.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

ADDITIONAL INFORMATION**EC Classification**

Symbol: F+, Xn; R: 12-40-52/53; S: (2)-9-16-33-36/37-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

CHLOROFORM**ICSC: 0027 (November 2000)**

Trichloromethane
Methane trichloride
Formyl trichloride

CAS #: 67-66-3**UN #: 1888****EC Number: 200-663-8**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. See Notes. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Dizziness. Drowsiness. Headache. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Redness. Pain. Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Rest. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Ventilation along the floor.	
PACKAGING	
Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

CHLOROFORM**ICSC: 0027****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

VOLATILE COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air.

Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive fumes of hydrogen chloride (see ICSC 0163), phosgene (see ICSC 0007) and chlorine (see ICSC 0126). Reacts violently with strong bases, strong oxidants and some metals such as aluminium, magnesium and zinc. This generates fire and explosion hazard. Attacks plastics, rubber and coatings.

Formula: CHCl_3

Molecular mass: 119.4

Boiling point: 62°C

Melting point: -64°C

Solubility in water, g/100ml at 20°C: 0.8

Vapour pressure, kPa at 20°C: 212

Relative vapour density (air = 1): 4.12

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.7

Octanol/water partition coefficient as log Pow: 1.97

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes. The substance may cause effects on the central nervous system, liver and kidneys. The effects may be delayed. Medical observation is indicated.

Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the liver and kidneys. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 2.5 mg/m³, 0.5 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.EU-OEL: 10 mg/m³, 2 ppm as TWA; (skin)**ENVIRONMENT**

The substance is toxic to aquatic organisms.

NOTES

Turns combustible on addition of small amounts of a flammable substance or an increase in the oxygen content of the air.

Use of alcoholic beverages enhances the harmful effect.

Depending on the degree of exposure, periodic medical examination is suggested.

The odour warning when the exposure limit value is exceeded is insufficient.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION**EC Classification**


Symbol: Xn; R: 22-38-40-48/20/22; S: (2)-36/37

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

METHYL CHLORIDE**ICSC: 0419 (June 2015)**Chloromethane
Monochloromethane**CAS #: 74-87-3****UN #: 1063****EC Number: 200-817-4**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Heating will cause rise in pressure with risk of bursting. Gas/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking handtools.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with water spray. In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.

STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Staggering gait. Dizziness. Headache. Nausea. Vomiting. Convulsions. Unconsciousness. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves. Protective clothing.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .
Eyes	See Skin.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	
Ingestion			

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Ventilation. NEVER direct water jet on liquid.	<p>According to UN GHS Criteria</p>  <p>DANGER</p> <p>Extremely flammable gas Contains gas under pressure; may explode if heated Suspected of damaging fertility or the unborn child May cause damage to central nervous system if inhaled May cause damage to central nervous system through prolonged or repeated exposure if inhaled</p> <p>Transportation UN Classification UN Hazard Class: 2.1</p>
STORAGE	
Fireproof. Ventilation along the floor.	
PACKAGING	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

METHYL CHLORIDE**ICSC: 0419****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUEFIED GAS.

Physical dangers

The gas is heavier than air and may travel along the ground; distant ignition possible. The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen. See Notes.

Chemical dangers

Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride and phosgene. Reacts violently with powdered aluminium, powdered zinc, aluminium trichloride and ethylene. This generates fire and explosion hazard. Attacks many metals in the presence of moisture.

Formula: CH₃Cl

Molecular mass: 50.5

Boiling point: -23.7°C

Melting point: -97°C

Relative density (water = 1): 0.91

Solubility in water, g/100ml at 25°C: 0.5

Vapour pressure, kPa at 25°C: 573

Relative vapour density (air = 1): 2.47

Flash point: Flammable gas

Auto-ignition temperature: 632°C

Explosive limits, vol% in air: 8.1-17.4

Octanol/water partition coefficient as log Pow: 0.91

Viscosity: 0.1834 cP at 20°C

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and through the skin.

Effects of short-term exposure

The liquid may cause frostbite. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause liver, cardiovascular system and kidney damage. Exposure could cause unconsciousness. Medical observation is indicated. The effects may be delayed.

Inhalation risk

A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

Effects of long-term or repeated exposure

The substance may have effects on the central nervous system. This may result in effects measured using behavioural tests. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 50 ppm as TWA; 100 ppm as STEL; (skin); A4 (not classifiable as a human carcinogen).

MAK: 21 mg/m³, 10 ppm; peak limitation category: II(1); pregnancy risk group: D.

EU-OEL: 42 mg/m³, 20 ppm as TWA

ENVIRONMENT**NOTES**

Following intoxication patient should be observed carefully for 48 hours.

Check oxygen content before entering area.

ADDITIONAL INFORMATION**EC Classification**

Symbol: F+, Xn; R: 12-40-48/20; S: (2)-9-16-33

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

SAFETY DATA SHEET

Creation Date 22-Sep-2009

Revision Date 23-Jan-2018

Revision Number 3

1. Identification

Product Name cis-1,2-Dichloroethylene

Cat No. : AC113380000; AC113380025; AC113380100; AC113380500

Synonyms cis-Acetylene dichloride.

Recommended Use Laboratory chemicals.

Uses advised against 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)

Flammable liquids	Category 2
Acute oral toxicity	Category 4
Acute Inhalation Toxicity - Vapors	Category 4
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word

Danger

Hazard Statements

Highly flammable liquid and vapor
Harmful if swallowed
Harmful if inhaled

Causes serious eye irritation
Causes skin irritation
May cause respiratory irritation

**Precautionary Statements****Prevention**

Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Avoid breathing dust/fume/gas/mist/vapors/spray
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Take precautionary measures against static discharge
Do not eat, drink or smoke when using this product

Response

Call a POISON CENTER or doctor/physician if you feel unwell

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell

Skin

IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation occurs: Get medical advice/attention

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention

Ingestion

Rinse mouth
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell

Fire

Explosion risk in case of fire
Fight fire with normal precautions from a reasonable distance
Evacuate area

Storage

Store in a well-ventilated place. Keep cool
Store in a closed container
Store locked up

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

None identified

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
cis-1,2-Dichloroethylene	156-59-2	97

4. First-aid measures

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Get medical attention.
Inhalation	Remove to fresh air. Get medical attention. If not breathing, give artificial respiration.
Ingestion	Do NOT induce vomiting. Get medical attention.
Most important symptoms and effects	Difficulty in breathing. 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	Water spray. Carbon dioxide (CO ₂). Dry chemical. Water mist may be used to cool closed containers. Chemical foam. Water mist may be used to cool closed containers.
Unsuitable Extinguishing Media	No information available
Flash Point	6 °C / 42.8 °F
Method -	No information available
Autoignition Temperature	440 °C / 824 °F
Explosion Limits	
Upper	12.80%
Lower	9.70%
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Flammable. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Vapors may form explosive mixtures with air.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO₂). Hydrogen chloride gas.

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.

NFPA

Health
2

Flammability
3

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment as required. Remove all sources of ignition. Take precautionary measures against static discharges. Avoid contact with skin, eyes or clothing.
Environmental Precautions	See Section 12 for additional Ecological Information. Do not flush into surface water or sanitary sewer system.
Methods for Containment and Clean Up	Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling	Ensure adequate ventilation. Wear personal protective equipment/face protection. Use spark-proof tools and explosion-proof equipment. Use only non-sparking tools. Avoid contact with skin, eyes or clothing. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded.
Storage	Keep in a dry, cool and well-ventilated place. Refer product specification and/or product label for specific storage temperature requirement. Keep container tightly closed. Keep away from heat, sparks and flame. Flammables area. Keep container tightly closed in a dry and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
cis-1,2-Dichloroethylene	TWA: 200 ppm			TWA: 200 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

Engineering Measures	Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment. 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	Wear appropriate protective gloves and clothing to prevent skin exposure.
Respiratory Protection	No protective equipment is needed under normal use conditions.
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	aromatic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-80 °C / -112 °F
Boiling Point/Range	60 °C / 140 °F @ 760 mmHg
Flash Point	6 °C / 42.8 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	12.80%
Lower	9.70%
Vapor Pressure	201 mmHg @ 25 °C
Vapor Density	3.34 (Air = 1.0)
Specific Gravity	1.280
Solubility	No information available
Partition coefficient; n-octanol/water	No data available

Autoignition Temperature	440 °C / 824 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C2 H2 Cl2
Molecular Weight	96.94

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Keep away from open flames, hot surfaces and sources of ignition. Exposure to air. Exposure to light. Incompatible products. Exposure to moist air or water.
Incompatible Materials	Bases
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO ₂), Hydrogen chloride gas
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Toxicologically Synergistic Products	No information available
--------------------------------------	--------------------------

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

Irritation	Irritating to eyes, respiratory system and skin
Sensitization	No information available
Carcinogenicity	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
cis-1,2-Dichloroethylene	156-59-2	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects	No information available
Reproductive Effects	No information available.
Developmental Effects	No information available.
Teratogenicity	No information available.
STOT - single exposure	Respiratory system
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

Do not empty into drains. Do not flush into surface water or sanitary sewer system. Harmful 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
cis-1,2-Dichloroethylene	Not listed	Not listed	EC50 = 721 mg/L 5 min EC50 = 905 mg/L 30 min	Not listed

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

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

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.

14. Transport information

DOT

UN-No UN1150
 Proper Shipping Name 1,2-DICHLOROETHYLENE
 Hazard Class 3
 Packing Group II

TDG

UN-No UN1150
 Proper Shipping Name 1,2-DICHLOROETHYLENE
 Hazard Class 3
 Packing Group II

IATA

UN-No UN1150
 Proper Shipping Name 1,2-DICHLOROETHYLENE
 Hazard Class 3
 Packing Group II

IMDG/IMO

UN-No UN1150
 Proper Shipping Name 1,2-DICHLOROETHYLENE
 Hazard Class 3
 Packing Group II

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
cis-1,2-Dichloroethylene	156-59-2	X	ACTIVE	-

Legend:

TSCA - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories

Canada (DSL/NDL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
cis-1,2-Dichloroethylene	156-59-2	-	X	205-859-7	-	X	X	X	KE-10124

U.S. Federal Regulations

SARA 313	Not applicable
SARA 311/312 Hazard Categories	See section 2 for more information
CWA (Clean Water Act)	Not applicable
Clean Air Act	Not applicable
OSHA - Occupational Safety and Health Administration	Not applicable

CERCLA

California Proposition 65	This product does not contain any Proposition 65 chemicals.
----------------------------------	---

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
cis-1,2-Dichloroethylene	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	23-Jan-2018
Print Date	23-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



TCI AMERICA

SAFETY DATA SHEET

Revision number: 3
Revision date: 11/10/2015

1. IDENTIFICATION

Product name: cis-1,3-Dichloropropene
Product code: D2792

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborage Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:

Acute Toxicity - Oral [Category 3]
Acute Toxicity - Dermal [Category 3]
Acute Toxicity - Inhalation [Category 3]
Skin Corrosion/Irritation [Category 2]
Eye Damage/Irritation [Category 2A]
Sensitization - Skin [Category 1]
Carcinogenicity [Category 2]
Specific Target Organ Toxicity (Single Exposure) [Category 2]
Specific Target Organ Toxicity (Repeated Exposure) [Category 2]
Flammable Liquids [Category 3]
Aquatic Hazard (Acute) [Category 1]
Aquatic Hazard (Long-Term) [Category 1]

Signal word: Danger!

Hazard Statement(s):
Causes serious eye irritation
Causes skin irritation
Flammable liquid and vapor
May cause an allergic skin reaction
Suspected of causing cancer
Toxic if swallowed
Toxic in contact with skin
Toxic if inhaled
Very toxic to aquatic life
Very toxic to aquatic life with long lasting effects
May cause damage to organs: Respiratory System
May cause damage to organs: Digestive Tract through prolonged or repeated exposure.

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

2. HAZARD(S) IDENTIFICATION**[Prevention]**

Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Wear protective gloves and protective clothing. Do not breathe fume, mist, vapors or spray. Use only outdoors or in a well-ventilated area. Wear protective gloves. Wear eye and face protection. Avoid breathing dusts or mists. Contaminated work clothing must not be allowed out of the workplace. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves, protective clothing, eye protection and face protection. Wash all exposed skin thoroughly after handling. Keep away from heat, sparks, open flames or other hot surfaces. - No smoking. Keep container tightly closed. Ground or bond container and receiving equipment. Use explosion-proof electrical, ventilating, lighting, and equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves, eye protection and face protection.

[Response]

If swallowed: Immediately call a poison center or doctor. Rinse mouth. If on skin: Wash with plenty of water. Call a poison center or doctor if you feel unwell. Take off immediately all contaminated clothing and wash it before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center or doctor. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse. If exposed or concerned: Get medical advice or attention. If exposed or concerned: Call a poison center or doctor. Get medical advice or attention if you feel unwell. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. In case of fire: Use dry chemical, CO₂, water spray or alcohol-resistant foam to extinguish.

[Storage]

Store locked up. Store in a well-ventilated place. Keep container tightly closed. Store in a well-ventilated place. Keep cool.

[Disposal]

Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture:	Substance
Components:	cis-1,3-Dichloropropene
Percent:	>98.0%(GC)
CAS Number:	10061-01-5
Molecular Weight:	110.97
Chemical Formula:	C ₃ H ₄ Cl ₂
Synonyms:	cis-3-Chloroallyl Chloride

4. FIRST-AID MEASURES**Inhalation:**

May cause coughing, difficult breathing and nausea. Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Inhalation of vapors or contact with substance will result in contamination and potential harmful effects. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact:

Immediately call a poison center or doctor. Effects of exposure (skin contact) to substance may be delayed. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact:

IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion:

Toxic if swallowed. Do not induce vomiting without medical advice. Effects of exposure (ingestion) to substance may be delayed. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:**Acute:**

Redness.

Delayed:

May cause skin sensitization. Possibly carcinogenic to humans.

4. FIRST-AID MEASURES**Immediate medical attention:**

WARNING: It might be dangerous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is toxic. CAUTION: Victim may be a source of contamination. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES**Suitable extinguishing media:**

Dry chemical, CO₂ or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical**Hazardous combustion products:**

These products include: Carbon oxides Halogenated compounds

Other specific hazards:

WARNING: Highly toxic HCl gas is produced during combustion.

Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. Do not use straight streams. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES**Personal precautions:**

Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Use spark-proof tools and explosion-proof equipment. Remove all sources of ignition. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment:

Wear eye protection (splash goggles) and face protection (full length face shield). Wear protective clothing (chemical resistant suit and chemical resistant boots). Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

Emergency procedures:

Isolate area until gas has dispersed. Do not clean-up or dispose except under supervision of a specialist. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and exercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). All equipment used when handling the product must be grounded. Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material.

Environmental precautions:

Keep away from living quarters. Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

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

Do NOT breath gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Do not ingest. Avoid contact with skin and eyes. Avoid contact with skin. Avoid exposure - obtain special instructions before use. Avoid prolonged or repeated exposure. Normal measures for preventive fire protection. Keep away from heat and sources of ignition. Use explosion-proof equipment. Use only non-sparking hand tool when handling this product. Ground all equipment containing material. Take measures to prevent build up of electrostatic charge. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage:

Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from sources of ignition. Store and use away from heat, sparks, open flame, or any other ignition source. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods. Store under inert gas (e.g. Argon).

Storage incompatibilities:

Combustible substances, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION**Exposure limits:**

No data available

8. EXPOSURE CONTROLS / PERSONAL PROTECTION**Appropriate engineering controls:**

Handle only in a fully enclosed system and equipment. Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection:	Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection:	Wear protective gloves.
Eye protection:	Splash goggles.
Skin and body protection:	Wear protective clothing (chemical resistant suit and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C):	Liquid	pH:	No data available
Form:	Clear	Vapor pressure:	5.7kPa/25°C
Color:	Colorless - Slightly pale yellow	Vapor density:	3.8
Odor:	No data available	Dynamic Viscosity:	No data available
Odor threshold:	No data available	Evaporation rate:	No data available
Melting point/freezing point:	No data available	Autoignition temperature:	392°C (738°F)
Boiling point/range:	104°C (219°F)	Flammability or explosive limits:	
Decomposition temperature:	No data available	Lower:	5.3%
Relative density:	1.23	Upper:	14.5%
Kinematic Viscosity:	No data available		
Partition coefficient:	No data available		
n-octanol/water (log P_{ow})	No data available		
Flash point:	27°C (81°F)		
Flammability (solid, gas):	No data available		
Solubility(ies):			
Water:	Very slightly soluble		
Soluble:	Ether, Benzene, Chloroform		

10. STABILITY AND REACTIVITY

Reactivity:	Not Available.
Chemical Stability:	Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions:	In use, may form flammable/explosive vapor-air mixture.
Conditions to avoid:	Avoid excessive heat and light.
Incompatible materials:	Oxidizing agents
Hazardous Decomposition Products:	No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: UC8325000

Acute Toxicity:
No data available

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
dns-hmn-hla 100 umol/L

mno-sat 20 ug/plate (+/-S9)

Carcinogenicity:

scu-mus TDLo:9240 mg/kg/77W-I

IARC: Group 2B (Possibly carcinogenic to humans) .**NTP:** b (Reasonably anticipated to be carcinogens).**OSHA:** No data available**Reproductive toxicity:**

No data available

Routes of Exposure:

Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Overexposure may result in serious illness or death. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Skin contact may result in redness, pain or dry skin. Eye contact may result in redness or pain. Skin contact may result in sensitization. Readily absorbed through skin.

Potential Health Effects:

Skin and eye contact may result in irritation.

Target organ(s):

May cause damage to organs: Respiratory System

May cause damage to organs: Digestive Tract through prolonged or repeated exposure.

12. ECOLOGICAL INFORMATION**Ecotoxicity**

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

Persistence and degradability:

No data available

Bioaccumulative potential (BCF):

<2.5 (conc. 34.6 ug/L), <26 (conc. 26 ug/L)

Mobility in soil:

No data available

Partition coefficient:

No data available

n-octanol/water (log P_{ow})**Soil adsorption (K_{oc}):**

No data available

Henry's Law:

No data available

constant (PaM³/mol)**13. DISPOSAL CONSIDERATIONS****Disposal of product:**

Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.

Disposal of container:

Dispose of as unused product. Do not re-use empty containers.

Other considerations:

Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION**DOT (US)****UN number:**
UN2047**Proper Shipping Name:**
Dichloropropenes**Class or Division:**
3 Flammable liquid**Packing Group:**
III**IATA****UN number:**
UN2047**Proper Shipping Name:**
Dichloropentanes**Class or Division:**
3 Flammable liquid**Packing Group:**
III**IMDG****UN number:**
UN2047**Proper Shipping Name:**
Dichloropropenes**Class or Division:**
3 Flammable liquid**Packing Group:**
III**EmS number:**

F-E, S-D

Reportable Quantity:

100 Pounds (45.4 Kilograms)

15. REGULATORY INFORMATION

15. REGULATORY INFORMATION**Toxic Substance Control Act (TSCA 8b.):**

This product is NOT on the EPA Toxic Substances Control Act (TSCA) inventory. The following notices are required by 40 CFR 720.36 (C) for those products not on the inventory list:

- (i) These products are supplied solely for use in research and development by or under the supervision of a technically qualified individual as defined in 40 CFR 720.0 et sec.
- (ii) The health risks of these products have not been fully determined. Any information that is or becomes available will be supplied on a SDS sheet.

US Federal Regulations**CERCLA Hazardous substance and Reportable Quantity:**

SARA 313:	Not Listed
SARA 302:	Not Listed

State Regulations**State Right-to-Know**

Massachusetts	Not Listed
New Jersey	Not Listed
Pennsylvania	Not Listed
California Proposition 65:	Not Listed

Other Information**NFPA Rating:**

Health:	2
Flammability:	3
Instability:	0

HMIS Classification:

Health:	2
Flammability:	3
Physical:	0

International Inventories

WHMIS hazard class:	B2: Flammable Liquid. D1B: Materials causing immediate and serious toxic effects. (Toxic) D2B: Materials causing other toxic effects. (Toxic)
EC-No:	233-195-8

16. OTHER INFORMATION

Revision date: 11/10/2015

Revision number: 3

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

CYCLOHEXANE**ICSC: 0242 (June 2011)**


Hexahydrobenzene
Hexamethylene
Hexanaphthene

CAS #: 110-82-7**UN #: 1145****EC Number: 203-806-2**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive. Heating will cause rise in pressure with risk of bursting.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools. Prevent build-up of electrostatic charges (e.g., by grounding).	Use water spray, foam, powder, carbon dioxide. Water may be ineffective. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Nausea. Headache. Dizziness. Weakness. Drowsiness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety goggles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Abdominal pain. Nausea. Vomiting. Aspiration hazard! Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Remove all ignition sources. Personal protection: self-contained breathing apparatus. Ventilation. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.	<p>According to UN GHS Criteria</p>  <p>DANGER</p> <p>Highly flammable liquid and vapour Causes eye irritation Causes mild skin irritation May cause drowsiness and dizziness May be fatal if swallowed and enters airways Very toxic to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II</p>
STORAGE	
Fireproof. Provision to contain effluent from fire extinguishing. Separated from strong oxidants. Store in an area without drain or sewer access.	
PACKAGING	



International
Labour
Organization

World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

CYCLOHEXANE

ICSC: 0242

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Heating may cause violent combustion or explosion. Reacts with strong oxidants.

Formula: C₆H₁₂

Molecular mass: 84.2

Boiling point: 81°C

Melting point: 7°C

Relative density (water = 1): 0.8

Solubility in water, g/100ml at 25°C: 0.0058 (very poor)

Vapour pressure, kPa at 20°C: 10.3

Relative vapour density (air = 1): 2.9

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2

Flash point: -18°C c.c.

Auto-ignition temperature: 260°C

Explosive limits, vol% in air: 1.3-8.4

Octanol/water partition coefficient as log Pow: 3.4

Viscosity: 1.26x10⁻⁶ mm²/s at 26°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure

The substance is mildly irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure could cause lowering of consciousness.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dryness and cracking and dermatitis.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 100 ppm as TWA.

MAK: 700 mg/m³, 200 ppm; peak limitation category: II(4); pregnancy risk group: D.EU-OEL: 700 mg/m³, 200 ppm as TWA

ENVIRONMENT

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.

ADDITIONAL INFORMATION

EC Classification

Symbol: F, Xn, N; R: 11-38-65-67-50/53; S: (2)-9-16-25-33-60-61-62; Note: 4

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

SAFETY DATA SHEET

Revision Date 14-Feb-2020

Revision Number 2

1. Identification

Product Name **Dibromochloromethane**

Cat No. : **A16938**

CAS-No 124-48-1
Synonyms CDBM; Dibromochloromethane

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.
Details of the supplier of the safety data sheet

Company

Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com

Emergency Telephone Number

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660.
After normal business hours, call Carechem 24 at (866) 928-0789.

2. Hazard(s) identification

Classification

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

Acute oral toxicity	Category 4
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word

Warning

Hazard Statements

Harmful if swallowed
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation

**Precautionary Statements****Prevention**

Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Wear protective gloves/protective clothing/eye protection/face protection
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell

Skin

IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash before reuse

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention

Ingestion

IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth

Storage

Store in a well-ventilated place. Keep container tightly closed
Store locked up

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

None identified

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Chlorodibromomethane	124-48-1	> 98

4. First-aid measures

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
Skin Contact	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention.
Inhalation	Remove from exposure, lie down. Remove to fresh air. If not breathing, give artificial respiration. Get medical attention.
Ingestion	Call a physician immediately. Clean mouth with water.
Most important symptoms and effects	Difficulty in breathing. 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 Water spray. Carbon dioxide (CO₂). Dry chemical. Chemical foam.

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

Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO₂). Hydrogen halides. Bromine. Hydrogen chloride gas.

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.

NFPA

Health
2

Flammability
0

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment as required.

Environmental Precautions See Section 12 for additional Ecological Information.

Methods for Containment and Clean Up Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Do not flush into surface water or sanitary sewer system.

7. Handling and storage

Handling Avoid contact with skin and eyes. Do not breathe mist/vapors/spray. Handle product only in closed system or provide appropriate exhaust ventilation.

Storage Keep in a dry place. Keep container tightly closed. Keep refrigerated.

8. Exposure controls / personal protection

Exposure Guidelines This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

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 Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection No protective equipment is needed under normal use conditions.

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

9. Physical and chemical properties

Physical State	Liquid
Appearance	Yellow-orange
Odor	sweet
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-22 °C / -7.6 °F
Boiling Point/Range	115 - 120 °C / 239 - 248 °F @ 760 mmHg
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	No information available
Vapor Density	7.2
Specific Gravity	2.451
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C H Br ₂ Cl
Molecular Weight	208.28

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products.
Incompatible Materials	Strong oxidizing agents, Strong acids, Strong bases, Strong reducing agents, Metals
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO ₂), Hydrogen halides, Bromine, Hydrogen chloride gas
Hazardous Polymerization	No information available.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Chlorodibromomethane	LD50 = 370 mg/kg (Rat)	Not listed	Not listed

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 The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Chlorodibromomethane	124-48-1	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects Substances which cause concern for man owing to possible mutagenic effects but for which the available information is not adequate for making a satisfactory assessment

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
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

Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Do not empty into drains.

Persistence and Degradability Persistence is unlikely

Bioaccumulation/ Accumulation No information available.

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

Component	log Pow
Chlorodibromomethane	2.09

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.

14. Transport information

DOT

UN-No UN2810
Hazard Class 6.1
Packing Group III

TDG

UN-No	UN2810
Hazard Class	6.1
Packing Group	III
IATA	Not regulated
IMDG/IMO	Not regulated

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Chlorodibromomethane	124-48-1	X	ACTIVE	-

Legend:

TSCA - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

- - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Chlorodibromomethane	124-48-1	-	X	204-704-0	-	-	-	-	-

U.S. Federal Regulations

SARA 313 Not applicable

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
Chlorodibromomethane	-	-	X	X

Clean Air Act Not applicable

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
Chlorodibromomethane	100 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Chlorodibromomethane	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**Health, Safety and Environmental Department
Email: tech@alfa.com
www.alfa.com**Revision Date**

14-Feb-2020

Print Date

14-Feb-2020

Revision Summary

SDS authoring systems update, replaces ChemGes SDS No. 124-48-1/2.

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

DICHLORODIFLUOROMETHANE**ICSC: 0048 (July 2002)**

Difluorodichloromethane

R 12

CFC 12

CAS #: 75-71-8**UN #: 1028****EC Number: 200-893-9**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep cylinder cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Irregular heartbeat. Confusion. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Ventilation.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 2.2
STORAGE	
Separated from incompatible materials. See Chemical Dangers. Cool. Ventilation along the floor.	
PACKAGING	
Special insulated cylinder.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

DICHLORODIFLUOROMETHANE**ICSC: 0048****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS COMPRESSED LIQUEFIED GAS WITH CHARACTERISTIC ODOUR.

Physical dangers

The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases of hydrogen chloride (see ICSC 0163), phosgene (see ICSC 0007), hydrogen fluoride (see ICSC 0283) and carbonyl fluoride (see ICSC 0633). Reacts violently with metals such as zinc and powdered aluminium. Attacks magnesium and its alloys.

Formula: CCl_2F_2

Molecular mass: 120.9

Boiling point: -30°C

Melting point: -158°C

Relative density (water = 1): 1.5

Solubility in water, g/100ml at 20°C : 0.03

Vapour pressure, kPa at 20°C : 568

Relative vapour density (air = 1): 4.2

Octanol/water partition coefficient as log Pow: 2.16

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation.

Effects of short-term exposure

Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the cardiovascular system and central nervous system. This may result in cardiac disorders and central nervous system depression. Exposure could cause lowering of consciousness. See Notes.

Inhalation risk

On loss of containment this substance can cause suffocation by lowering the oxygen content of the air in confined areas.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS**

TLV: 1000 ppm as TWA; A4 (not classifiable as a human carcinogen).

MAK: 5000 mg/m^3 , 1000 ppm; peak limitation category: II(2); pregnancy risk group: C

ENVIRONMENT

Avoid release to the environment because of its impact on the ozone layer.

NOTES

High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death.

Check oxygen content before entering area.

The odour warning when the exposure limit value is exceeded is insufficient.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

ETHANOL (ANHYDROUS)**ICSC: 0044 (May 2018)**


Ethyl alcohol
Absolute ethanol
Methyl carbinol
Grain alcohol

CAS #: 64-17-5**UN #: 1170****EC Number: 200-578-6**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive. Risk of fire and explosion on contact with incompatible substances. See Chemical Dangers.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. NO contact with incompatible materials: See Chemical Dangers	Use water spray, powder, alcohol-resistant foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Headache. Fatigue. Drowsiness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin	Dry skin.	Protective clothing. Apron. Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain. Burning sensation.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Headache. Confusion. Dizziness. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Remove all ignition sources. Ventilation. Do NOT wash away into sewer. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in inert absorbent. Wash away remainder with plenty of water. Store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>Highly flammable liquid and vapour Harmful if swallowed Causes serious eye irritation May cause damage to organs through prolonged or repeated exposure</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II</p>
STORAGE	
Fireproof. Separated from : see Chemical Dangers.	
PACKAGING	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



ETHANOL (ANHYDROUS)**ICSC: 0044****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour mixes well with air, explosive mixtures are easily formed.

Chemical dangers

Reacts slowly with calcium hypochlorite, silver oxide and ammonia. This generates fire and explosion hazard. Reacts violently with strong oxidants such as nitric acid, silver nitrate, mercuric nitrate and magnesium perchlorate. This generates fire and explosion hazard.

Formula: $\text{CH}_3\text{CH}_2\text{OH}$ / $\text{C}_2\text{H}_6\text{O}$

Molecular mass: 46.1

Boiling point: 78°C

Melting point: -114 °C

Relative density (water = 1): 0.79

Solubility in water: miscible

Vapour pressure, kPa at 20°C: 5.8

Relative vapour density (air = 1): 1.6

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.03

Flash point: 12.0 °C c.c.

Auto-ignition temperature: 400°C

Explosive limits, vol% in air: 3.1-27.7

Octanol/water partition coefficient as log Pow: -0.32

Viscosity: 1.074 mPa*s at 20°C

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure

The substance is severely irritating to the eyes. The vapour at high levels is irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the upper respiratory tract and central nervous system. This may result in irritation, headache, fatigue and lack of concentration. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1000 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 380 mg/m³, 200 ppm; peak limitation category: II(4); carcinogen category: 5; pregnancy risk group: C; germ cell mutagen group: 5

ENVIRONMENT

Environmental effects of the substance have been adequately investigated, but no significant effects have been found.

NOTES

Ethanol consumption during pregnancy may adversely affect the unborn child.

Chronic ingestion of ethanol may cause liver cirrhosis and cancer.


ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

ETHYL ACETATE**ICSC: 0367 (April 2014)**Acetic acid, ethyl ester
Acetic ether**CAS #: 141-78-6****UN #: 1173****EC Number: 205-500-4**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive. Heating will cause rise in pressure with risk of bursting.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking handtools. Do NOT use compressed air for filling, discharging, or handling.	Use alcohol-resistant foam, foam, powder, carbon dioxide, fine water spray. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Headache. Drowsiness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Dry skin.	Protective gloves.	Rinse contaminated clothes (fire hazard) with plenty of water. Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible).
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Seek medical attention if you feel unwell.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Remove all ignition sources. Evacuate danger area! Consult an expert! Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT wash away into sewer. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  DANGER Highly flammable liquid and vapour May cause drowsiness or dizziness Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II
STORAGE	
Fireproof. Separated from strong oxidants, strong bases and strong acids.	
PACKAGING	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

ETHYL ACETATE

ICSC: 0367

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers

Reacts with strong oxidants. This generates fire and explosion hazard.

Reacts violently with strong bases and strong acids. Attacks rubber and some forms of plastic.

Formula: $C_4H_8O_2$ / $CH_3COOC_2H_5$

Molecular mass: 88.1

Boiling point: 77°C

Melting point: -84°C

Relative density (water = 1): 0.9

Solubility in water, g/100ml at 20°C: 8.7 (poor)

Vapour pressure, kPa at 20°C: 10

Relative vapour density (air = 1): 3.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2

Flash point: -4°C c.c.

Auto-ignition temperature: 427°C

Explosive limits, vol% in air: 2.0-12.8

Octanol/water partition coefficient as log Pow: 0.73

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour.

Effects of short-term exposure

The substance is mildly irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause lowering of consciousness.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 400 ppm as TWA.

MAK: 750 mg/m³, 200 ppm; peak limitation category: I(2); pregnancy risk group: C.EU-OEL: 734 mg/m³, 200 ppm as TWA; 1468 mg/m³, 400 ppm as STEL

ENVIRONMENT

NOTES

Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification

Symbol: F, Xi; R: 11-36-66-67; S: (2)-16-26-33

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.


ETHYLBENZENE**ICSC: 0268 (November 2007)**

Ethylbenzol
Phenylethane
EB

CAS #: 100-41-4**UN #: 1175****EC Number: 202-849-4**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	Use dry powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Dizziness. Drowsiness. Headache.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation in the throat and chest. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
<p>Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance.</p> <p>Ventilation. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.</p>	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>Highly flammable liquid and vapour Harmful if inhaled May be harmful if swallowed Causes mild skin irritation Causes eye irritation Suspected of causing cancer May cause respiratory irritation May cause drowsiness and dizziness May be harmful if swallowed and enters airways Toxic to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II</p>
STORAGE	
Fireproof. Separated from strong oxidants. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	
PACKAGING	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



ETHYLBENZENE

ICSC: 0268

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH AROMATIC ODOUR.

Physical dangers

The vapour mixes well with air, explosive mixtures are easily formed.

Chemical dangers

Reacts with strong oxidants. Attacks plastics and rubber.

Formula: C₈H₁₀/C₆H₅C₂H₅

Molecular mass: 106.2

Boiling point: 136°C

Melting point: -95°C

Relative density (water = 1): 0.9

Solubility in water, g/100ml at 20°C: 0.015

Vapour pressure, kPa at 20°C: 0.9

Relative vapour density (air = 1): 3.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02

Flash point: 18°C c.c.

Auto-ignition temperature: 432°C

Explosive limits, vol% in air: 1.0-6.7

Octanol/water partition coefficient as log Pow: 3.1

Viscosity: 0.6 mm²/s at 25°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure above the OEL could cause lowering of consciousness.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

This substance is possibly carcinogenic to humans. The substance may have effects on the kidneys and liver. This may result in impaired functions.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.

MAK: 88 mg/m³, 20 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.EU-OEL: 442 mg/m³, 100 ppm as TWA; 884 mg/m³, 200 ppm as STEL; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.

ADDITIONAL INFORMATION

EC Classification


Symbol: F, Xn; R: 11-20; S: (2)-16-24/25-29

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

n-HEPTANE Heptane	ICSC: 0657 (June 2015)
CAS #: 142-82-5 UN #: 1206 EC Number: 205-563-8	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	Use alcohol-resistant foam, dry powder, carbon dioxide, water spray. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Incoordination. Dizziness. Weakness. Nausea. Drowsiness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Swelling. Pain.	Protective gloves.	Rinse and then wash skin with water and soap. Refer for medical attention if skin irritation occurs.
Eyes	Redness.	Wear safety goggles in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Aspiration hazard! Sore throat. Abdominal pain. Headache. Dizziness. Nausea. Vomiting. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Give nothing to drink. Do NOT induce vomiting. Refer immediately for medical attention. See Notes.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Remove all ignition sources. Consult an expert! Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  </div> <p style="text-align: center;">DANGER</p> <p>Highly flammable liquid and vapour May be fatal if swallowed and enters airways Causes skin irritation May cause drowsiness or dizziness Very toxic to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II</p>
STORAGE	
Fireproof. Separated from strong oxidants. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Marine pollutant.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



n-HEPTANE**ICSC: 0657****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

VOLATILE COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Reacts violently with strong oxidants. This generates fire and explosion hazard. Attacks many plastics.

Formula: C₇H₁₆ / CH₃(CH₂)₅CH₃

Molecular mass: 100.2

Boiling point: 98.4°C

Melting point: -90.7°C

Density (at 20°C): 0.68 g/ml

Solubility in water, mg/l at 25°C: 2.2 (very poor)

Vapour pressure, kPa at 20°C: 4.6

Relative vapour density (air = 1): 3.5

Flash point: -7°C c.c.

Auto-ignition temperature: 220°C

Explosive limits, vol% in air: 0.8-6.7

Octanol/water partition coefficient as log Pow: 4.66

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure

The substance is irritating to the skin. The vapour is irritating to the respiratory tract. If swallowed the substance easily enters the airways and could result in aspiration pneumonia. The substance may cause effects on the central nervous system.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 400 ppm as TWA; 500 ppm as STEL.

MAK: 2100 mg/m³, 500 ppm; peak limitation category: I(1); pregnancy risk group: D.EU-OEL: 2085 mg/m³, 500 ppm as TWA**ENVIRONMENT**

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. Bioaccumulation of this chemical may occur in fish. It is strongly advised not to let the chemical enter into the environment.

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.

The symptoms of chemical pneumonitis do not become manifest until a few hours or even days have passed.

ADDITIONAL INFORMATION**EC Classification**

Symbol: F, Xn, N; R: 11-38-50/53-65-67; S: (2)-9-16-29-33-60-61-62; Note: C

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

HEXACHLOROBUTADIENE**ICSC: 0896 (August 1997)**1,1,2,3,4,4-Hexachloro-1,3-butadiene
Perchlorobutadiene**CAS #: 87-68-3****UN #: 2279****EC Number: 201-765-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Burning sensation. Cough. Sore throat. Symptoms may be delayed. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Pain. Redness. Blisters. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Pain. Redness. Severe deep burns. Loss of vision.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Separated from food and feedstuffs. Well closed. Ventilation along the floor. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Do not transport with food and feedstuffs. Severe marine pollutant.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

HEXACHLOROBUTADIENE

ICSC: 0896

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Attacks rubber and some forms of plastic.

Formula: C_4Cl_6 / $CCl_2=CCICCl=CCl_2$

Molecular mass: 260.8

Boiling point: 212°C

Melting point: -18°C

Relative density (water = 1): 1.68

Solubility in water: none

Vapour pressure, Pa at 20°C: 20

Relative vapour density (air = 1): 9.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 90°C

Auto-ignition temperature: 610°C

Octanol/water partition coefficient as log Pow: 4.90

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The liquid is corrosive. The substance may cause effects on the kidneys.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. May cause genetic damage in humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.02 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 0.22 mg/m³, 0.02 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. The substance may cause long-term effects in the aquatic environment.

NOTES

ADDITIONAL INFORMATION

EC Classification

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

n-HEXANE Hexyl hydride	ICSC: 0279 (April 2000)
CAS #: 110-54-3 UN #: 1208 EC Number: 203-777-6	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Lethargy. Headache. Nausea. Weakness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Rest. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Consult an expert! Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Remove all ignition sources. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II
STORAGE	
Fireproof. Separated from strong oxidants. Well closed.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

n-HEXANE**ICSC: 0279****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

VOLATILE COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers

Reacts with strong oxidants. This generates fire and explosion hazard. Attacks some plastics, rubber and coatings.

Formula: C₆H₁₄

Molecular mass: 86.2

Boiling point: 69°C

Melting point: -95°C

Relative density (water = 1): 0.7

Solubility in water, g/100ml at 20°C: 0.0013

Vapour pressure, kPa at 20°C: 17

Relative vapour density (air = 1): 3.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.3

Flash point: -22°C c.c.

Auto-ignition temperature: 225°C

Explosive limits, vol% in air: 1.1-7.5

Octanol/water partition coefficient as log Pow: 3.9

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure

The substance is irritating to the skin. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure at high levels could cause lowering of consciousness.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the central nervous system and peripheral nervous system. This may result in polyneuropathy. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 50 ppm as TWA; (skin); BEI issued.

MAK: 180 mg/m³, 50 ppm; peak limitation category: II(8); pregnancy risk group: C.EU-OEL: 72 mg/m³, 20 ppm as TWA**ENVIRONMENT**

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

ADDITIONAL INFORMATION**EC Classification**

Symbol: F, Xn, N; R: 11-38-48/20-62-65-67-51/53; S: (2)-9-16-29-33-36/37-61-62

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.


ISOPROPYL ALCOHOL**ICSC: 0554 (July 2020)**

1-methylethanol
2-hydroxypropane
2-Propanol
Propan-2-ol
Isopropanol
Dimethylcarbinol

CAS #: 67-63-0**UN #: 1219****EC Number: 200-661-7**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive. Risk of explosion on contact with strong oxidants.	NO open flames, NO sparks and NO smoking. NO contact with strong oxidizing agents. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	Use water, powder, alcohol-resistant foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Headache. Dizziness. Drowsiness. Further see Ingestion.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin.	Protective gloves.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again. See Notes.
Eyes	Redness. Pain. Blurred vision. Burns.	Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation. Abdominal pain. Nausea. Vomiting. Ataxia. Convulsions. Laboured breathing. Low blood pressure. Cardiac dysrhythmia. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give nothing to drink. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Remove all ignition sources. Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable non-plastic containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Wash away remainder with plenty of water.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>Highly flammable liquid and vapour Causes serious eye irritation May cause drowsiness or dizziness</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II</p>
STORAGE	
Fireproof. Separated from strong oxidants. Cool. Well closed.	
PACKAGING	



World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European Commission

ISOPROPYL ALCOHOL

ICSC: 0554

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID.

Physical dangers

The vapour mixes well with air, explosive mixtures are easily formed.

Chemical dangers

Reacts with strong oxidants. This generates explosion hazard.
 Decomposes on heating. This produces irritating fumes and flammable and toxic gas. Attacks some plastics and rubber.

Formula: C₃H₈O / CH₃CHOHCH₃

Molecular mass: 60.1

Boiling point: 83°C

Melting point: -90°C

Relative density (water = 1): 0.79

Solubility in water: miscible

Vapour pressure, kPa at 20°C: 4.4

Relative vapour density (air = 1): 2.1

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.05

Flash point: 11.7°C c.c.

Auto-ignition temperature: 456°C

Explosive limits, vol% in air: 2-12

Octanol/water partition coefficient as log Pow: 0.05

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour.

Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause unconsciousness.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dryness and cracking.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 200 ppm as TWA; 400 ppm as STEL; A4 (not classifiable as a human carcinogen); BEI issued.

MAK: 500 mg/m³, 200 ppm; peak limitation category: II(2); pregnancy risk group: C

ENVIRONMENT

Environmental effects of the substance have been adequately investigated, but no significant effects have been found.

NOTES

When large surface areas of skin and clothes are exposed to the pure substance the fire hazard is the main concern, for which rinsing first and then removing clothes is advised.

ADDITIONAL INFORMATION


EC Classification

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

CUMENE**ICSC: 0170 (April 2014)**(1-Methylethyl)benzene
2-Phenylpropane
Isopropylbenzene**CAS #: 98-82-8****UN #: 1918****EC Number: 202-704-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 31°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 31°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Incoordination. Drowsiness. Headache.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	See Inhalation. Aspiration hazard!	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit and filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	<p>According to UN GHS Criteria</p>  <p>DANGER</p> <p>Flammable liquid and vapour Harmful if swallowed Suspected of causing cancer May be fatal if swallowed and enters airways Very toxic to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III</p>
STORAGE	
Fireproof. Separated from strong oxidants and acids. Cool. Keep in the dark. Store only if stabilized. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Marine pollutant.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

CUMENE**ICSC: 0170****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Reacts violently with acids and strong oxidants. This generates fire and explosion hazard. The substance can form explosive peroxides.

Formula: C_9H_{12} / $C_6H_5CH(CH_3)_2$

Molecular mass: 120.2

Boiling point: 152°C

Melting point: -96°C

Relative density (water = 1): 0.90

Solubility in water, g/l at 20°C: 0.2 (very poor)

Vapour pressure, Pa at 20°C: 427

Relative vapour density (air = 1): 4.2

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01

Flash point: 31°C c.c.

Auto-ignition temperature: 420°C

Explosive limits, vol% in air: 0.9-6.5

Octanol/water partition coefficient as log Pow: 3.66

Viscosity: 0.85 mm²/s at 25°C**EXPOSURE & HEALTH EFFECTS****Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

If swallowed the substance easily enters the airways and could result in aspiration pneumonitis. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause unconsciousness.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and upper respiratory tract. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 50 mg/m³, 10 ppm; peak limitation category: II(4); skin absorption (H); carcinogen category: 3; pregnancy risk group: C.EU-OEL: 50 mg/m³, 10 ppm as TWA; 250 mg/m³, 50 ppm as STEL; (skin)**ENVIRONMENT**

The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Check for peroxides prior to distillation; eliminate if found.

Do NOT take working clothes home.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn, N; R: 10-37-51/53-65; S: (2)-24-37-61-62; Note: C


All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

METHYL BROMIDE**ICSC: 0109 (November 2009)**Bromomethane
Monobromomethane**CAS #: 74-83-9****UN #: 1062****EC Number: 200-813-2**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with aluminium, zinc, magnesium or oxygen.	NO open flames. NO contact with aluminium, zinc, magnesium or pure oxygen.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with appropriate extinguishing agent. In case of fire: keep cylinder cool by spraying with water.

STRICT HYGIENE! IN ALL CASES CONSULT A DOCTOR! FIRST AID: USE PERSONAL PROTECTION.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Dizziness. Headache. Abdominal pain. Vomiting. Weakness. Shortness of breath. Confusion. Hallucinations. Loss of speech. Incoordination. Convulsions. Symptoms may be delayed. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Tingling sensation. Itching. Burning sensation. Redness. Blisters. Pain. ON CONTACT WITH LIQUID: FROSTBITE. Further see Inhalation.	Cold-insulating gloves. Protective clothing.	Rinse skin with plenty of water or shower. ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer immediately for medical attention.
Eyes	Redness. Pain. Blurred vision. Temporary loss of vision.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion			

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Ventilation. NEVER direct water jet on liquid.	<p>According to UN GHS Criteria</p>  <p>DANGER</p> <p>Contains gas under pressure; may explode if heated Toxic if inhaled Causes skin and eye irritation Causes damage to lungs, kidneys and central nervous system if inhaled Causes damage to the liver, the kidneys and the central nervous system through prolonged or repeated exposure if inhaled Harms public health and the environment by destroying ozone in the upper atmosphere</p> <p>Transportation UN Classification UN Hazard Class: 2.3</p>
STORAGE	
Fireproof if in building. Separated from strong oxidants, aluminium and cylinders containing oxygen. Cool. Ventilation along the floor.	
PACKAGING	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021





METHYL BROMIDE**ICSC: 0109****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

ODOURLESS COLOURLESS COMPRESSED LIQUEFIED GAS.

Physical dangers

The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

Chemical dangers

Decomposes on heating. This produces toxic and corrosive fumes including hydrogen bromide, bromine and carbon oxybromide. Reacts with strong oxidants. Attacks many metals in the presence of water. Attacks aluminium, zinc and magnesium. This produces pyrophoric compounds. This generates fire and explosion hazard.

Formula: CH₃Br

Molecular mass: 94.9

Boiling point: 4°C

Melting point: -94°C

Relative density (water = 1): 1.7 (liquid, 0°C)

Solubility in water, g/100ml at 20°C: 1.5

Vapour pressure, kPa at 20°C: 1893

Relative vapour density (air = 1): 3.3

Flash point: 194°C

Auto-ignition temperature: 537°C

Explosive limits, vol% in air: 10-16

Octanol/water partition coefficient as log Pow: 1.19

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and through the skin also as a vapour.

Effects of short-term exposure

The substance, as a liquid, is severely irritating to the skin. The substance, as a liquid, is irritating to the eyes and respiratory tract. Inhalation may cause lung oedema. See Notes. Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the central nervous system and kidneys. The effects may be delayed up to 48 hours. Exposure at high levels could cause death. Medical observation is indicated.

Inhalation risk

A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

Effects of long-term or repeated exposure

The substance may have effects on the nervous system, kidneys and liver. This may result in impaired functions. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1 ppm as TWA; (skin); A4 (not classifiable as a human carcinogen).

MAK: peak limitation category: I(2); carcinogen category: 3; pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. Avoid release to the environment because of its impact on the ozone layer. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.

Toxic effects on the nervous system may be delayed for several hours.

Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered.

Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 23/25-36/37/38-48/20-68-50-59; S: (1/2)-15-27-36/39-38-45-59-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

METHYL ETHYL KETONE**ICSC: 0179 (April 2017)**


Ethyl methyl ketone
2-Butanone
MEK
Methyl acetone

CAS #: 78-93-3**UN #: 1193****EC Number: 201-159-0**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	Use alcohol-resistant foam, water, powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Headache. Dizziness. Nausea. Vomiting. Drowsiness. Numbness. Laboured breathing.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give nothing to drink. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: self-contained breathing apparatus. Do NOT wash away into sewer. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>Highly flammable liquid and vapour Causes serious eye irritation May cause respiratory irritation May cause drowsiness or dizziness Suspected of damaging fertility or the unborn child May be harmful if swallowed and enters airways</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II</p>
STORAGE	
Fireproof. Separated from strong oxidants and strong acids. Cool. Well closed. Store in an area without drain or sewer access.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

METHYL ETHYL KETONE**ICSC: 0179****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers

Reacts violently with strong oxidants and inorganic acids. This generates fire and explosion hazard. Attacks some plastics.

Formula: C_4H_8O / $CH_3COCH_2CH_3$

Molecular mass: 72.1

Boiling point: 80°C

Melting point: -86°C

Relative density (water = 1): 0.8

Solubility in water, g/100ml at 20°C: 29 (good)

Vapour pressure, kPa at 20°C: 10.5

Relative vapour density (air = 1): 2.41

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.1

Flash point: -9°C c.c.

Auto-ignition temperature: 505°C

Explosive limits, vol% in air: 1.8-11.5

Octanol/water partition coefficient as log Pow: 0.29

Viscosity: 0.40 cP at 25°C

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, by ingestion and through the skin.

Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system. Exposure could cause unconsciousness. If swallowed the substance easily enters the airways and could result in aspiration pneumonitis.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 200 ppm as TWA; 300 ppm as STEL; BEI issued.

MAK: 600 mg/m³, 200 ppm; peak limitation category: I(1); skin absorption (H); pregnancy risk group: C.EU-OEL: 600 mg/m³, 200 ppm as TWA; 900 mg/m³, 300 ppm as STEL**ENVIRONMENT**

Avoid release to the environment in circumstances different to normal use.

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.

ADDITIONAL INFORMATION**EC Classification**

Symbol: F, Xi; R: 11-36-66-67; S: (2)-9-16; Note: 6

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

METHYL TERT-BUTYL ETHER**ICSC: 1164 (November 2000)**

tert-Butyl methyl ether
MTBE
Methyl-1,1-dimethylethyl ether
2-Methoxy-2-methyl propane

CAS #: 1634-04-4**UN #: 2398****EC Number: 216-653-1**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. NO contact with oxidizing agents. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Drowsiness. Dizziness. Headache. Weakness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Nausea. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II
STORAGE	
Fireproof. Separated from strong oxidants and strong acids.	
PACKAGING	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



METHYL TERT-BUTYL ETHER**ICSC: 1164****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangersReacts violently with strong oxidants. This generates fire hazard.
Decomposes on contact with acids.Formula: $(\text{CH}_3)_3\text{COCH}_3$ / $\text{C}_5\text{H}_{12}\text{O}$

Molecular mass: 88.2

Boiling point: 55°C

Melting point: -109°C

Relative density (water = 1): 0.7

Solubility in water, g/100ml at 20°C: 4.2

Vapour pressure, kPa at 20°C: 27

Relative vapour density (air = 1): 3.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.5

Flash point: -28°C c.c.

Auto-ignition temperature: 375°C

Explosive limits, vol% in air: 1.6-15.1

Octanol/water partition coefficient as log Pow: 1.06

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

The substance is irritating to the skin. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure far above the OEL could cause lowering of consciousness.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS**

TLV: 50 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 180 mg/m³, 50 ppm; carcinogen category: 3; pregnancy risk group: C.EU-OEL: 183.5 mg/m³, 50 ppm as TWA; 367 mg/m³, 100 ppm as STEL**ENVIRONMENT**

It is strongly advised not to let the chemical enter into the environment because it is persistent.

NOTES

Much less likely to form peroxides than other ethers.

ADDITIONAL INFORMATION**EC Classification**


Symbol: F, Xi; R: 11-38; S: (2)-9-16-24

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

DICHLOROMETHANE**ICSC: 0058 (April 2017)**Methylene chloride
DCM**CAS #: 75-09-2****UN #: 1593****EC Number: 200-838-9**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable under specific conditions. See Notes. Gives off irritating or toxic fumes (or gases) in a fire. Explosive under specific conditions. See Notes. Heating will cause rise in pressure with risk of bursting. Risk of fire and explosion.	NO contact with incompatible substances. See Chemical Dangers. See Notes.	In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Weakness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Administration of oxygen may be needed. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Dry skin. Redness. Burning sensation.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Pain. Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Administration of oxygen may be needed. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: self-contained breathing apparatus. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>Harmful if swallowed Fatal if inhaled Causes skin and eye irritation May cause drowsiness or dizziness Causes damage to central nervous system, blood, liver, the heart and lungs May be harmful if swallowed and enters airways Causes damage to the central nervous system through prolonged or repeated exposure if inhaled May cause cancer</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III</p>
STORAGE	
Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Well closed. Cool. Ventilation along the floor.	
PACKAGING	
Do not transport with food and feedstuffs. Unbreakable packaging. Put breakable packaging into closed unbreakable container.	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021



DICHLOROMETHANE**ICSC: 0058****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

VERY VOLATILE COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Decomposes on heating or on burning and on contact with hot surfaces. This produces toxic and corrosive fumes including hydrogen chloride (see ICSC 0163), phosgene (see ICSC 0007) and carbon monoxide (see ICSC 0023). Reacts violently with strong oxidants, strong bases and metals such as aluminium powder and magnesium powder. This generates fire and explosion hazard. Attacks some forms of plastic, rubber and coatings.

Formula: CH₂Cl₂

Molecular mass: 84.9

Boiling point: 40°C

Melting point: -97°C

Relative density (water = 1): 1.3 (20°C)

Solubility in water, g/100ml at 20°C: 1.3 (moderate)

Vapour pressure, kPa at 20°C: 47.4

Relative vapour density (air = 1): 2.9

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.9

Auto-ignition temperature: 605°C

Explosive limits, vol% in air: 13-22

See Notes.

Octanol/water partition coefficient as log Pow: 1.25

Viscosity: 0.32 mm²/s at 20°C

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, by ingestion and through the skin.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis. The substance may cause effects on the central nervous system, blood, liver, heart and lungs. Exposure could cause carbon monoxide poisoning. This may result in impaired functions. Exposure at high concentrations could cause lowering of consciousness and death. The effects may be delayed.

Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance may have effects on the central nervous system. This substance is probably carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 50 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans); (skin).

MAK: 180 mg/m³, 50 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 5; pregnancy risk group: B.

EU-OEL: 353 mg/m³, 100 ppm as TWA; 706 mg/m³, 200 ppm as STEL; (skin)

ENVIRONMENT**NOTES**

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

The odour warning when the exposure limit value is exceeded is insufficient.

Depending on the degree of exposure, periodic medical examination is suggested.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn; R: 40; S: (2)-23-24/25-36/37

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

m-XYLENE

meta-Xylene
1,3-Dimethylbenzene
m-Xylol

ICSC: 0085 (August 2002)**CAS #: 108-38-3****UN #: 1307****EC Number: 203-576-3**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 27°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 27°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
<p>Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance.</p> <p>Ventilation. Remove all ignition sources. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.</p>	<p>According to UN GHS Criteria</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III</p>
STORAGE	
Fireproof. Separated from strong oxidants and strong acids.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

m-XYLENE**ICSC: 0085****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Reacts with strong acids and strong oxidants.

Formula: $C_6H_4(CH_3)_2$ / C_8H_{10}

Molecular mass: 106.2

Boiling point: 139°C

Melting point: -48°C

Relative density (water = 1): 0.86

Solubility in water: none

Vapour pressure, kPa at 20°C: 0.8

Relative vapour density (air = 1): 3.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02

Flash point: 27°C c.c.

Auto-ignition temperature: 527°C

Explosive limits, vol% in air: 1.1-7.0

Octanol/water partition coefficient as log Pow: 3.20

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes and skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.
 The substance may have effects on the central nervous system.
 Exposure to the substance may increase noise-induced hearing loss.
 Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 100 ppm as TWA; A4 (not classifiable as a human carcinogen); BEI issued.

EU-OEL: 150 ppm as STEL; 221 mg/m³, 50 ppm as TWA; 442 mg/m³, 100 ppm as STEL; (skin).MAK: 220 mg/m³, 50 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: D**ENVIRONMENT**

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

The recommendations on this Card also apply to technical xylene.

See ICSCs 0084 and 0086.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn; R: 10-20/21-38; S: (2)-25; Note: C

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.



TCI AMERICA

SAFETY DATA SHEET

Page 1 of 6

Revision number: 2
Revision date: 10/06/2014

1. IDENTIFICATION

Product name: Butylbenzene
Product code: B0713

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborside Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

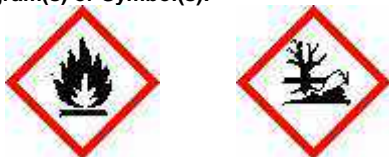
2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Eye Damage/Irritation [Category 2B]
Flammable Liquids [Category 3]
Aquatic Hazard (Acute) [Category 1]
Aquatic Hazard (Long-Term) [Category 1]

Signal word: Warning!

Hazard Statement(s):
Causes eye irritation
Flammable liquid and vapor
Very toxic to aquatic life
Very toxic to aquatic life with long lasting effects

Pictogram(s) or Symbol(s):



Precautionary Statement(s):
[Prevention]

Wash hands and face thoroughly after handling. Keep away from heat, sparks, open flames or other hot surfaces. - No smoking. Keep container tightly closed. Ground or bond container and receiving equipment. Use explosion-proof electrical, ventilating, lighting, and equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves, eye protection and face protection.

[Response]

If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. In case of fire: Use dry chemical, CO₂, water spray or alcohol-resistant foam to extinguish.

[Storage]

Store in a well-ventilated place. Keep cool.

[Disposal]

Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

Hazards not otherwise classified: [HNOC] Causes mild skin irritation.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture:	Substance
Components:	Butylbenzene
Percent:	>99.0%(GC)
CAS Number:	104-51-8
Molecular Weight:	134.22
Chemical Formula:	C ₁₀ H ₁₄

4. FIRST-AID MEASURES

Inhalation:	Call emergency medical service. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Skin contact:	Call a poison center or doctor if you feel unwell. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Eye contact:	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Ingestion:	Do not induce vomiting without medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Symptoms/effects:	
Acute:	Redness.
Delayed:	No data available
Immediate medical attention:	If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media:	Dry chemical, CO ₂ , water spray, or alcohol-resistant foam. Consult with local fire authorities before attempting large scale fire fighting operations.
--------------------------------------	---

Specific hazards arising from the chemical

Hazardous combustion products:	These products include: Carbon oxides
Other specific hazards:	Closed containers may explode from heat of a fire.

Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. Do not use straight streams. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Use spark-proof tools and explosion-proof equipment. Remove all sources of ignition. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
Personal protective equipment:	Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

6. ACCIDENTAL RELEASE MEASURES**Emergency procedures:**

Isolate area until gas has dispersed. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and exercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). All equipment used when handling the product must be grounded. Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material.

Environmental precautions:

Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

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

Do NOT breathe gas, fumes, vapor, or spray. Avoid contact with skin and eyes. Keep away from heat and sources of ignition. Use explosion-proof equipment. Use only non-sparking hand tool when handling this product. Ground all equipment containing material. Take measures to prevent build up of electrostatic charge. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage:

Keep containers tightly closed in a cool, well-ventilated place. Keep away from sources of ignition. Store and use away from heat, sparks, open flame, or any other ignition source. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities:

Combustible substances, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION**Exposure limits:**

No data available

Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment**Respiratory protection:**

Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection:

Wear protective gloves.

Eye protection:

Splash goggles.

Skin and body protection:

Lab coat.

9. PHYSICAL AND CHEMICAL PROPERTIES**Physical state (20°C):**

Liquid

Form:

Clear

Color:

Colorless - Almost colorless

Odor:

Characteristic

Odor threshold:

No data available

Melting point/freezing point:

-88°C (-126°F)

Boiling point/range:

183°C (361°F)

Decomposition temperature:

No data available

Relative density:

0.86

Kinematic Viscosity:

No data available

Partition coefficient:

4.38

n-octanol/water (log P_{ow})**pH:**

No data available

Vapor pressure:

0.1kPa/25°C

Vapor density:

4.6

Dynamic Viscosity:

No data available

Evaporation rate:

No data available

(Butyl Acetate = 1)

Flash point:

59°C (138°F)

Flammability (solid, gas):

No data available

Autoignition temperature:

410°C (770°F)

Flammability or explosive limits:

Lower: 0.8%

Upper: 5.8%

Solubility(ies):

Water: Insoluble (11.8mg/L, 25°C)

Miscible: Ether, Alcohols, Benzene

10. STABILITY AND REACTIVITY

Reactivity:	Not Available.
Chemical Stability:	Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions:	In use, may form flammable/explosive vapor-air mixture.
Conditions to avoid:	Avoid excessive heat and light.
Incompatible materials:	Oxidizing agents
Hazardous Decomposition Products:	No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: CY9070000

Acute Toxicity:
orl-rat LDLo:10 mL/kg

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:

No data available

IARC: No data available

NTP: No data available

OSHA: No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:
Eye contact may result in redness or pain. Skin contact may result in redness, pain or dry skin.

Potential Health Effects:
Skin and eye contact may result in irritation.

Target organ(s): No data available

12. ECOLOGICAL INFORMATION**Ecotoxicity**

Fish:	96h LC50:3.3 mg/L (Oryzias latipes)
Crustacea:	48h EC50:1.0 mg/L (Daphnia magna)
Algae:	72h EC50:1.1 mg/L (Selenastrum capricornutum)

Persistence and degradability: No data available

Bioaccumulative potential (BCF): 470

Mobility in soil: No data available

Partition coefficient: 4.38

n-octanol/water (log P_{ow})

Soil adsorption (K_{oc}): No data available

Henry's Law: 1621

constant (PaM³/mol)

13. DISPOSAL CONSIDERATIONS

Disposal of product:	Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container:	Dispose of as unused product. Do not re-use empty containers.
Other considerations:	Observe all federal, state and local regulations when disposing of the substance.

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

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2709	Butyl benzenes	3 Flammable liquid	III

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2709	Butylbenzenes	3 Flammable liquid	III

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2709	Butylbenzenes	3 Flammable liquid	III

EmS number: F-E, S-D

15. REGULATORY INFORMATION**Toxic Substance Control Act (TSCA 8b.):**

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations**CERCLA Hazardous substance and Reportable Quantity:**

SARA 313:	Not Listed
SARA 302:	Not Listed

State Regulations**State Right-to-Know**

Massachusetts	Not Listed
New Jersey	Listed
Pennsylvania	Not Listed
California Proposition 65:	Not Listed

Other Information**NFPA Rating:**

Health:	0
Flammability:	2
Instability:	0

HMIS Classification:

Health:	0
Flammability:	2
Physical:	0

International Inventories

WHMIS hazard class:	B2: Flammable Liquid. D2B: Materials causing other toxic effects. (Toxic)
EC-No:	203-209-7

16. OTHER INFORMATION

Revision date: 10/06/2014

Revision number: 2

16. OTHER INFORMATION

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

o-XYLENE

ortho-Xylene
1,2-Dimethylbenzene
o-Xylol

ICSC: 0084 (August 2002)**CAS #: 95-47-6****UN #: 1307****EC Number: 202-422-2**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 32°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 32°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
<p>Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance.</p> <p>Ventilation. Remove all ignition sources. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.</p>	<p>According to UN GHS Criteria</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III</p>
STORAGE	
Fireproof. Separated from strong oxidants and strong acids.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

o-XYLENE**ICSC: 0084****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Reacts with strong acids and strong oxidants.

Formula: $C_6H_4(CH_3)_2$ / C_8H_{10}

Molecular mass: 106.2

Boiling point: 144°C

Melting point: -25°C

Relative density (water = 1): 0.88

Solubility in water: none

Vapour pressure, kPa at 20°C: 0.7

Relative vapour density (air = 1): 3.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02

Flash point: 32°C c.c.

Auto-ignition temperature: 463°C

Explosive limits, vol% in air: 0.9-6.7

Octanol/water partition coefficient as log Pow: 3.12

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes and skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.
 The substance may have effects on the central nervous system.
 Exposure to the substance may increase noise-induced hearing loss.
 Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 100 ppm as TWA; 150 ppm as STEL; A4 (not classifiable as a human carcinogen); BEI issued.

MAK: 220 mg/m³, 50 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: D.EU-OEL: 221 mg/m³, 50 ppm as TWA; 442 mg/m³, 100 ppm as STEL; (skin)**ENVIRONMENT**

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

The recommendations on this Card also apply to technical xylene.

See ICSCs 0085 and 0086.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn; R: 10-20/21-38; S: (2)-25; Note: C

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

PROPYLENE

Methylethylene
Propene
Methylethene

ICSC: 0559 (November 1998)**CAS #: 115-07-1****UN #: 1077****EC Number: 204-062-1**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Extremely flammable. Gas/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding) if in liquid state.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with powder, carbon dioxide. In case of fire: keep cylinder cool by spraying with water. NO direct contact with water. Combat fire from a sheltered position.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Drowsiness. Suffocation. See Notes.	Use ventilation.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention.
Eyes	See Skin.	Wear safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Ventilation. Remove all ignition sources. NEVER direct water jet on liquid. Personal protection: chemical protection suit including self-contained breathing apparatus.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 2.1
STORAGE	
Fireproof. Cool.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

PROPYLENE

ICSC: 0559

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS COMPRESSED LIQUEFIED GAS.

Physical dangers

The gas is heavier than air and may travel along the ground; distant ignition possible. The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Reacts violently with oxidants. This generates fire and explosion hazard.

Formula: C₃H₆ / CH₂CHCH₃

Molecular mass: 42.1

Boiling point: -48°C

Melting point: -185°C

Relative density (water = 1): 0.5

Solubility in water: poor

Vapour pressure, kPa at 25°C: 1158

Relative vapour density (air = 1): 1.5

Flash point: Flammable gas

Auto-ignition temperature: 460°C

Explosive limits, vol% in air: 2.4-10.3

Octanol/water partition coefficient as log Pow: 1.77

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation.

Effects of short-term exposure

Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the central nervous system. Exposure could cause lowering of consciousness. See Notes.

Inhalation risk

On loss of containment this substance can cause suffocation by lowering the oxygen content of the air in confined areas.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

TLV: 500 ppm as TWA; A4 (not classifiable as a human carcinogen)

ENVIRONMENT

NOTES

High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death.

Check oxygen content before entering area.

Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

ADDITIONAL INFORMATION

EC Classification

Symbol: F+; R: 12; S: (2)-9-16-33

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

p-XYLENE**ICSC: 0086 (August 2002)**

para-Xylene
1,4-Dimethylbenzene
p-Xylol
paraxylene

CAS #: 106-42-3**UN #: 1307****EC Number: 203-396-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 27°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 27°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
<p>Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance.</p> <p>Ventilation. Remove all ignition sources. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.</p>	<p>According to UN GHS Criteria</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III</p>
STORAGE	
Fireproof. Separated from strong oxidants and strong acids.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

p-XYLENE**ICSC: 0086****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Reacts with strong acids and strong oxidants.

Formula: $C_6H_4(CH_3)_2$ / C_8H_{10}

Molecular mass: 106.2

Boiling point: 138°C

Melting point: 13°C

Relative density (water = 1): 0.86

Solubility in water: none

Vapour pressure, kPa at 20°C: 0.9

Relative vapour density (air = 1): 3.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02

Flash point: 27°C c.c.

Auto-ignition temperature: 528°C

Explosive limits, vol% in air: 1.1-7.0

Octanol/water partition coefficient as log Pow: 3.15

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes and skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.
 The substance may have effects on the central nervous system.
 Exposure to the substance may increase noise-induced hearing loss.
 Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 100 ppm as TWA; 150 ppm as STEL; A4 (not classifiable as a human carcinogen); BEI issued.

MAK: 220 mg/m³, 50 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: D.EU-OEL: 221 mg/m³, 50 ppm as TWA; 442 mg/m³, 100 ppm as STEL; (skin)**ENVIRONMENT**

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

The recommendations on this Card also apply to technical xylene.

See ICSCs 0084 and 0085.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn; R: 10-20/21-38; S: (2)-25; Note: C

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.



TCI AMERICA

SAFETY DATA SHEET

Revision number: 2
Revision date: 10/06/2014

1. IDENTIFICATION

Product name: sec-Butylbenzene
Product code: B0714

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborside Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

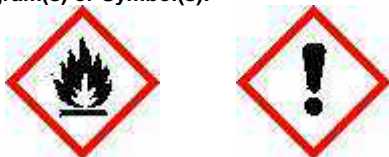
2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Acute Toxicity - Oral [Category 4]
Skin Corrosion/Irritation [Category 2]
Eye Damage/Irritation [Category 2B]
Flammable Liquids [Category 3]

Signal word: Warning!

Hazard Statement(s):
Causes eye irritation
Causes skin irritation
Flammable liquid and vapor
Harmful if swallowed

Pictogram(s) or Symbol(s):



Precautionary Statement(s):
[Prevention]

[Response]

[Storage]
[Disposal]

Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Wear protective gloves. Keep away from heat, sparks, open flames or other hot surfaces. - No smoking. Keep container tightly closed. Ground or bond container and receiving equipment. Use explosion-proof electrical, ventilating, lighting, and equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves, eye protection and face protection.
If swallowed: Immediately call a poison center or doctor. Rinse mouth. If on skin: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. In case of fire: Use dry chemical, CO₂, water spray or alcohol-resistant foam to extinguish.
Store in a well-ventilated place. Keep cool.
Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture:	Substance
Components:	sec-Butylbenzene
Percent:	>99.0%(GC)
CAS Number:	135-98-8
Molecular Weight:	134.22
Chemical Formula:	C ₁₀ H ₁₄
Synonyms:	2-Phenylbutane

4. FIRST-AID MEASURES

Inhalation:	Call a poison center or doctor if you feel unwell. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Skin contact:	Call a poison center or doctor if you feel unwell. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Eye contact:	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Ingestion:	Harmful if swallowed. Do not induce vomiting without medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Symptoms/effects:	
Acute:	Redness.
Delayed:	No data available
Immediate medical attention:	WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is harmful. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media:	Dry chemical, CO ₂ , water spray, or alcohol-resistant foam. Consult with local fire authorities before attempting large scale fire fighting operations.
--------------------------------------	---

Specific hazards arising from the chemical

Hazardous combustion products:	These products include: Carbon oxides
Other specific hazards:	Closed containers may explode from heat of a fire.

Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. Do not use straight streams. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Use spark-proof tools and explosion-proof equipment. Remove all sources of ignition. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
------------------------------	---

6. ACCIDENTAL RELEASE MEASURES

Personal protective equipment:	Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).
Emergency procedures:	Isolate area until gas has dispersed. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and exercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). All equipment used when handling the product must be grounded. Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material.

Environmental precautions:

Keep away from living quarters. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling:	Do NOT breath gas, fumes, vapor, or spray. Do not ingest. Avoid contact with skin and eyes. Keep away from heat and sources of ignition. Use explosion-proof equipment. Use only non-sparking hand tool when handling this product. Ground all equipment containing material. Take measures to prevent build up of electrostatic charge. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.
Conditions for safe storage:	Keep containers tightly closed in a cool, well-ventilated place. Keep away from sources of ignition. Store and use away from heat, sparks, open flame, or any other ignition source. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.
Storage incompatibilities:	Combustible substances, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits:	No data available
-------------------------	-------------------

Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection:	Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection:	Wear protective gloves.
Eye protection:	Splash goggles.
Skin and body protection:	Lab coat.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C):	Liquid		
Form:	Clear		
Color:	Colorless - Almost colorless		
Odor:	No data available		
Odor threshold:	No data available		
Melting point/freezing point:	-83°C (-117°F)	pH:	No data available
Boiling point/range:	173°C (343°F)	Vapor pressure:	0.2kPa/25°C
Decomposition temperature:	No data available	Vapor density:	4.62
Relative density:	0.86	Dynamic Viscosity:	No data available
Kinematic Viscosity:	No data available		
Partition coefficient:	4.57	Evaporation rate:	No data available
n-octanol/water (log P_{ow})		(Butyl Acetate = 1)	
Flash point:	52°C (126°F)	Autoignition temperature:	415°C (779°F)
Flammability (solid, gas):	No data available	Flammability or explosive limits:	
		Lower:	0.8%
		Upper:	6.9%

Solubility(ies):

9. PHYSICAL AND CHEMICAL PROPERTIES**Water:** Insoluble (17.6mg/L, 25°C)**Miscible:** Ether, Alcohols, Benzene**10. STABILITY AND REACTIVITY**

Reactivity:	Not Available.
Chemical Stability:	Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions:	In use, may form flammable/explosive vapor-air mixture.
Conditions to avoid:	Avoid excessive heat and light.
Incompatible materials:	Strong oxidizing agents
Hazardous Decomposition Products:	No data available

11. TOXICOLOGICAL INFORMATION**RTECS Number:** CY9100000**Acute Toxicity:**

orl-mus LD50:8700 mg/kg

orl-rat LD50:2240 uL/kg

skn-rbt LD50:>16 mL/kg

Skin corrosion/irritation:

skn-rbt 100 mg/24H MOD

Serious eye damage/irritation:

eye-rbt 500 mg/24H MLD

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available**NTP:** No data available**OSHA:** No data available**Reproductive toxicity:**

No data available

Routes of Exposure:

Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Overexposure may result in serious illness or death. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Skin contact may result in redness, pain or dry skin. Eye contact may result in redness or pain.

Potential Health Effects:

Skin and eye contact may result in irritation.

Target organ(s): No data available**12. ECOLOGICAL INFORMATION****Ecotoxicity**

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

Persistence and degradability:

No data available

Bioaccumulative potential (BCF):

660

Mobility in soil:

No data available

Partition coefficient:

4.57

n-octanol/water (log P_{ow})**Soil adsorption (K_{oc}):**

7200

Henry's Law:

182.3

constant (PaM³/mol)

13. DISPOSAL CONSIDERATIONS

Disposal of product:	Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container:	Dispose of as unused product. Do not re-use empty containers.
Other considerations:	Observe all federal, state and local regulations when disposing of the substance.

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

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2709	Butyl benzenes	3 Flammable liquid	III

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2709	Butylbenzenes	3 Flammable liquid	III

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2709	Butylbenzenes	3 Flammable liquid	III

EmS number: F-E, S-D

15. REGULATORY INFORMATION**Toxic Substance Control Act (TSCA 8b.):**

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations**CERCLA Hazardous substance and Reportable Quantity:**

SARA 313:	Not Listed
SARA 302:	Not Listed

State Regulations**State Right-to-Know**

Massachusetts	Not Listed
New Jersey	Not Listed
Pennsylvania	Not Listed
California Proposition 65:	Not Listed

Other Information**NFPA Rating:**

Health:	0
Flammability:	2
Instability:	0

HMIS Classification:

Health:	0
Flammability:	2
Physical:	0

International Inventories**WHMIS hazard class:**

B2: Flammable Liquid.
D2A: Materials causing other toxic effects. (Very Toxic)
D2B: Materials causing other toxic effects. (Toxic)

EC-No: 205-227-0

16. OTHER INFORMATION

Revision date: 10/06/2014

Revision number: 2

16. OTHER INFORMATION

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.


STYRENE**ICSC: 0073 (April 2006)**

Vinylbenzene
Phenylethylene
Ethenylbenzene

CAS #: 100-42-5**UN #: 2055****EC Number: 202-851-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Gives off irritating or toxic fumes (or gases) in a fire. Above 31°C explosive vapour/air mixtures may be formed. See Notes.	NO open flames, NO sparks and NO smoking. Above 31°C use a closed system, ventilation and explosion-proof electrical equipment.	Use dry powder. Use foam. Use carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Vomiting. Weakness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain.	Protective clothing. Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Rest.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Remove all ignition sources. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>Flammable liquid and vapour Harmful if inhaled Causes skin and eye irritation Suspected of causing cancer Causes damage to the central nervous system and the liver through prolonged or repeated exposure Toxic to aquatic life</p>
STORAGE	<p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III</p>
Fireproof. Separated from incompatible materials. See Chemical Dangers. Cool. Keep in the dark. Store only if stabilized. Store in an area without drain or sewer access.	
PACKAGING	
Airtight. Marine pollutant.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



STYRENE**ICSC: 0073****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS-TO-YELLOW OILY LIQUID.

Physical dangers**Chemical dangers**

The substance can form explosive peroxides. The substance may polymerize due to warming, under the influence of light, oxidants, oxygen and peroxides. This generates fire and explosion hazard. Reacts violently with strong acids and strong oxidants. This generates fire and explosion hazard. Attacks rubber, copper and copper alloys.

Formula: C_8H_8 / $C_6H_5CHCH_2$

Molecular mass: 104.2

Boiling point: 145°C

Melting point: -30.6°C

Relative density (water = 1): 0.91

Solubility in water, g/100ml at 20°C: 0.03

Vapour pressure, kPa at 20°C: 0.67

Relative vapour density (air = 1): 3.6

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02

Flash point: 31°C c.c.

Auto-ignition temperature: 490°C

Explosive limits, vol% in air: 0.9-6.8

Octanol/water partition coefficient as log Pow: 3.0

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure at high levels could cause unconsciousness.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. This substance is possibly carcinogenic to humans. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; 20 ppm as STEL; (OTO); A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.
MAK: 86 mg/m³, 20 ppm; peak limitation category: II(2); carcinogen category: 5; pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

Check for peroxides prior to distillation; eliminate if found.

Styrene monomer vapours are uninhibited and may form polymers in vents or flame arresters of storage tanks, resulting in blockage of vents.

Do NOT take working clothes home.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn; R: 10-20-36/38; S: (2)-23; Note: D

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.


TETRACHLOROETHYLENE**ICSC: 0076 (April 2013)**

PER
Ethylene Tetrachloride
PERC
Tetracap
1,1,2,2-tetrachloroethene
1,1,2,2-Tetrachloroethylene
Perchloroethylene
Tetrachloroethene

CAS #: 127-18-4**UN #: 1897****EC Number: 204-825-9**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with metals. See Chemical Dangers.	NO open flames, NO sparks and NO smoking. NO contact with hot surfaces or finely divided metals. NO contact with metals. See Chemical Dangers	In case of fire in the surroundings, use appropriate extinguishing media.

STRICT HYGIENE! PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Dizziness. Headache. Drowsiness. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	Dry skin. Redness. Burning sensation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Burning sensation. Pain.	Wear safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Sore throat. Aspiration hazard! See Inhalation. Cardiac dysrhythmia. Respiratory arrest.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance and complete protective clothing. Ventilation. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>WARNING</p> </div> <p>Causes skin irritation Suspected of causing cancer May be harmful if swallowed and enters airways May cause drowsiness or dizziness Toxic to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III</p>
STORAGE	
Separated from metals, ignition sources and food and feedstuffs. See Chemical Dangers. Keep in the dark. Keep in a well-ventilated room. Dry. Cool.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	



World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European Commission

TETRACHLOROETHYLENE**ICSC: 0076****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive fumes of hydrogen chloride, phosgene and chlorine. Decomposes slowly on contact with moisture. This produces trichloroacetic acid and hydrochloric acid. Reacts violently with finely divided metals. This generates fire and explosion hazard.

Formula: C_2Cl_4 / $Cl_2C=CCl_2$

Molecular mass: 165.8

Boiling point: 121°C

Melting point: -22°C

Density (at 20°C): 1.62 g/cm³

Solubility in water, g/100ml at 20°C: 0.015

Vapour pressure, kPa at 20°C: 1.9

Relative vapour density (air = 1): 5.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.09

Octanol/water partition coefficient as log Pow: 3.4

Auto-ignition temperature: > 650°C

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, by ingestion and through the skin.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis. The substance may cause effects on the central nervous system. Exposure at high levels could cause unconsciousness.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver, kidneys and central nervous system. This substance is probably carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 25 ppm as TWA; 100 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.

MAK: 69 mg/m³, 10 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 3; pregnancy risk group: C.EU-OEL: 138 mg/m³, 20 ppm as TWA; 275 mg/m³, 40 ppm as STEL; (skin)**ENVIRONMENT**

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

The odour warning when the exposure limit value is exceeded is insufficient.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

Use of alcoholic beverages enhances the harmful effect.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn, N; R: 40-51/53; S: (2)-23-36/37-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

TETRAHYDROFURAN**ICSC: 0578 (November 2019)**


Tetramethylene oxide
Diethylene oxide
1,4-Epoxybutane
Oxacyclopentane

CAS #: 109-99-9**UN #: 2056****EC Number: 203-726-8**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	Use alcohol-resistant foam, water spray, powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS! STRICT HYGIENE!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Burning sensation in the throat and chest. Dizziness. Headache. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.
Skin	Dry skin. Redness. Pain.	Protective gloves. Protective clothing.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or face shield.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Remove all ignition sources. Ventilation. Do NOT wash away into sewer. Collect leaking liquid in sealable air tight containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p>  <p>ANGER</p> <p>Highly flammable liquid and vapour Harmful if swallowed Causes skin irritation Causes serious eye irritation May cause respiratory irritation Suspected of causing cancer May cause damage to kidneys and liver through prolonged or repeated exposure</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II</p>
STORAGE	
Fireproof. Well closed. Separated from : see Chemical Dangers.	
PACKAGING	
Airtight.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

TETRAHYDROFURAN**ICSC: 0578****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers

The substance can form explosive peroxides. Reacts violently with strong oxidants, strong bases and some metal halides. This generates fire and explosion hazard. Attacks some forms of plastic, rubber and coatings.

Formula: C_4H_8O / $(CH_2)_3CH_2O$

Molecular mass: 72.1

Boiling point: 66°C

Melting point: -108.5°C

Relative density (water = 1): 0.89

Solubility in water: freely soluble

Vapour pressure, kPa at 20°C: 19.3

Relative vapour density (air = 1): 2.5

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.28

Flash point: -14.5°C c.c.

Auto-ignition temperature: 321°C

Explosive limits, vol% in air: 2-11.8

Octanol/water partition coefficient as log Pow: 0.46 (estimated)

Viscosity: 0.5 mPa*s at 20°C

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour, by ingestion and through the skin.

Effects of short-term exposure

The substance and the vapour are irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system at high levels. This may result in narcosis.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidneys. This may result in impaired functions. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 50 ppm as TWA; 100 ppm as STEL; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 150 mg/m³, 50 ppm; peak limitation category: I(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.EU-OEL: 150 mg/m³, 50 ppm as TWA; 300 mg/m³, 100 ppm as STEL; (skin)**ENVIRONMENT****NOTES**

The odour warning when the exposure limit value is exceeded is insufficient.

Check for peroxides prior to distillation; eliminate if found.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

TOLUENE**ICSC: 0078 (October 2002)**

Methylbenzene
Toluol
Phenylmethane

CAS #: 108-88-3**UN #: 1294****EC Number: 203-625-9**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Dizziness. Drowsiness. Headache. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: chemical protection suit and self-contained breathing apparatus. Ventilation. Remove all ignition sources. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II
STORAGE	
Fireproof. Separated from strong oxidants.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

TOLUENE**ICSC: 0078****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour mixes well with air, explosive mixtures are easily formed. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Reacts violently with strong oxidants. This generates fire and explosion hazard.

Formula: $C_6H_5CH_3$ / C_7H_8

Molecular mass: 92.1

Boiling point: 111°C

Melting point: -95°C

Relative density (water = 1): 0.87

Solubility in water: none

Vapour pressure, kPa at 25°C: 3.8

Relative vapour density (air = 1): 3.1

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01

Flash point: 4°C c.c.

Auto-ignition temperature: 480°C

Explosive limits, vol% in air: 1.1-7.1

Octanol/water partition coefficient as log Pow: 2.69

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure at high levels could cause cardiac dysrhythmia and unconsciousness.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 ppm as TWA; (OTO); A4 (not classifiable as a human carcinogen); BEI issued.

MAK: 190 mg/m³, 50 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: C.

EU-OEL: 192 mg/m³, 50 ppm as TWA; 384 mg/m³, 100 ppm as STEL; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

Use of alcoholic beverages enhances the harmful effect.

ADDITIONAL INFORMATION**EC Classification**

Symbol: F, Xn; R: 11-38-48/20-63-65-67; S: (2)-36/37-46-62

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

Avocado Research Chemicals Ltd - Material Safety Data Sheet 10384

1. IDENTIFICATION OF SUBSTANCE AND SUPPLIER			
Name On Label	trans-1,2-Dichloroethylene		
Product Number	10384		
Supplier	Johnson Matthey Catalog Company Inc. 30 Bond Street, Ward Hill, Massachusetts, 01835-8099 Emergency Telephone Number: (978) 521-6300; CHEMTREC: (800) 424-9300		
Alternative Names	None in common use.		
2. COMPOSITION AND INFORMATION ON COMPONENTS			
Name	trans-1,2-Dichloroethylene		
Minor Impurities	Not determined		
CAS No.	156-60-5	EINECS No. 2058602	EEC No.
3. HAZARDS IDENTIFICATION			
Designation	HIGHLY FLAMMABLE ~ IRRITANT		
Risk Phrases	R11 Highly flammable. R20/21/22 Harmful by inhalation, in contact with skin and if swallowed. R36/37/38 Irritating to eyes, respiratory system and skin.		
4. FIRST AID MEASURES			
Inhalation	Remove to fresh air. If breathing is difficult give oxygen and seek medical attention.		
Eye Contact	Flush with copious amounts of water for at least 15 minutes. If irritation persists, seek medical attention.		
Skin Contact	Remove contaminated clothing. Wash affected area with soap and water. Rinse thoroughly. If irritation persists or other symptoms are observed, seek medical advice.		
Ingestion	Rinse out mouth and drink lots of water. In case of irritation or other symptoms, seek medical attention.		
5. FIRE FIGHTING MEASURES			
Extinguishing Medium	Use fire fighting measures which suit the environment and take into account other materials which may be involved. In general, water-based extinguishers should not be used for fires involving organic materials. Use carbon dioxide or dry powder.		
Protective Equipment	Wear self-contained breathing apparatus and protective clothing.		
Hazardous Products of Combustion may include: carbon monoxide, carbon dioxide, hydrogen chloride (hydrochloric acid).			
6. ACCIDENTAL RELEASE MEASURES			
Personal Protection	Keep away from ignition sources. Avoid inhalation of vapour. Wear protective equipment including rubber gloves, eye protection and breathing equipment. Keep unprotected persons away.		
Environmental Protection	Take precautions to ensure product does not contaminate the ground or enter the drainage system.		
Collection	Absorb in vermiculite or proprietary absorbent material and transfer to sealed containers for disposal.		
7. HANDLING AND STORAGE			
Handling	Chemicals should be used only by those trained in handling potentially hazardous materials. Rubber gloves, eye protection and protective clothing should be worn. Operations should be carried out in an efficient fume hood or equivalent system.		
Storage	Store in tightly sealed containers in a cool place. Protect from moisture.		
8. EXPOSURE CONTROLS AND PERSONAL PROTECTION			
Respiratory	Volatile product. Avoid inhalation of vapour. Handle in an efficient fume hood or equivalent system.		
Eye	Avoid eye contact. Wear safety spectacles, goggles or, for larger quantities, a full face mask.		
Hands and Body	Irritant product. Avoid skin contact. Wear rubber gloves, protective clothing and, for larger quantities, full arm, body and face protection. Wash hands thoroughly after handling.		

Continued on next page...

10384 continued.

9. PHYSICAL AND CHEMICAL PROPERTIES				
Appearance	Colorless liquid			
Physical Constants	Not available			
Molecular formula	C ₂ H ₂ Cl ₂	Formula Wt.	96.94	
Water solubility	Sl sol	Density	1.257	
Flash Point	6°			
10. STABILITY AND REACTIVITY				
Specific Hazard				
Incompatibilities	Oxidising agents.			
Decomposition	Hazardous products of decomposition may include: carbon monoxide, carbon dioxide, hydrogen chloride (hydrochloric acid).			
11. TOXICOLOGICAL INFORMATION				
RTECS No.	KV9400000			
Acute Toxicity	LD ₅₀ : ORL-RAT 1235mg/kg; SKN-RBT >5gm/kg Harmful by inhalation, in contact with skin and if swallowed. Irritating to eyes, respiratory system and skin.			
Special Note	Symptoms of exposure may include nausea, dizziness and headache. Prolonged exposure can have a narcotic effect.			
Chronic Toxicity	Possible mutagen. May cause damage to the heart, bone marrow and the gastrointestinal and immune systems.			
12. ECOLOGICAL EFFECTS				
General	Take care to prevent chemicals from entering the ground, water courses or drainage systems.			
13. DISPOSAL CONSIDERATIONS				
Disposal	Disposal should be via an approved contractor and should take full account of local regulations.			
14. TRANSPORT INFORMATION				
UN Number	1150			
Land Transport	ADR/RIC Code/Class	3.2	Packing Group II	
Maritime Transport	IMDG Code/Class	3.2	Packing Group II	
Air Transport	IATA Code/Class	3.2	Packing Group II	
15. REGULATORY INFORMATION				
CAS No. 156-60-5	EINECS No. 2058602	EEC No.	UN No. 1150	RTECS No. KV9400000
Hazard Indication	HIGHLY FLAMMABLE ~ IRRITANT			
Risk & Safety Phrases	Highly flammable. Harmful by inhalation, in contact with skin and if swallowed. Irritating to eyes, respiratory system and skin. Keep container tightly closed. Keep away from sources of ignition - No Smoking. Do not empty into drains. Wear suitable protective clothing.			
TSCA	Listed substance.			
16. OTHER INFORMATION				
It must be recognised that the physical and chemical properties of any product may not be fully understood and that new, possibly hazardous products may arise from reactions between chemicals. The information given in this data sheet is based on our present knowledge and shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.				
Date of Last Review:	3rd August 1998		Date Printed:	18th September 1998



TCI AMERICA

SAFETY DATA SHEET

Revision number: 4
Revision date: 08/15/2016

1. IDENTIFICATION

Product name: trans-1,3-Dichloropropene
Product code: D2346

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborage Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:

Acute Toxicity - Oral [Category 3]
Acute Toxicity - Dermal [Category 3]
Acute Toxicity - Inhalation [Category 3]
Skin Corrosion/Irritation [Category 2]
Eye Damage/Irritation [Category 2A]
Sensitization - Skin [Category 1]
Carcinogenicity [Category 2]
Specific Target Organ Toxicity (Single Exposure) [Category 2]
Specific Target Organ Toxicity (Repeated Exposure) [Category 2]
Flammable Liquids [Category 3]
Aquatic Hazard (Acute) [Category 1]
Aquatic Hazard (Long-Term) [Category 1]

Signal word: Danger!

Hazard Statement(s):
Causes serious eye irritation
Causes skin irritation
Flammable liquid and vapor
May cause an allergic skin reaction
Suspected of causing cancer
Toxic if swallowed
Toxic in contact with skin
Toxic if inhaled
Very toxic to aquatic life
Very toxic to aquatic life with long lasting effects
May cause damage to organs: Respiratory System
May cause damage to organs: Digestive Tract through prolonged or repeated exposure.

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

2. HAZARD(S) IDENTIFICATION**[Prevention]**

Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Wear protective gloves and protective clothing. Do not breathe fume, mist, vapors or spray. Use only outdoors or in a well-ventilated area. Wear protective gloves. Wear eye and face protection. Avoid breathing dusts or mists. Contaminated work clothing must not be allowed out of the workplace. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves, protective clothing, eye protection and face protection. Wash all exposed skin thoroughly after handling. Keep away from heat, sparks, open flames or other hot surfaces. - No smoking. Keep container tightly closed. Ground or bond container and receiving equipment. Use explosion-proof electrical, ventilating, lighting, and equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves, eye protection and face protection.

[Response]

If swallowed: Immediately call a poison center or doctor. Rinse mouth. If on skin: Wash with plenty of water. Call a poison center or doctor if you feel unwell. Take off immediately all contaminated clothing and wash it before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center or doctor. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse. If exposed or concerned: Get medical advice or attention. If exposed or concerned: Call a poison center or doctor. Get medical advice or attention if you feel unwell. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. In case of fire: Use dry chemical, CO₂, water spray or alcohol-resistant foam to extinguish.

[Storage]

Store locked up. Store in a well-ventilated place. Keep container tightly closed. Store in a well-ventilated place. Keep cool.

[Disposal]

Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture:	Substance
Components:	trans-1,3-Dichloropropene
Percent:	>98.0%(GC)
CAS Number:	10061-02-6
Molecular Weight:	110.97
Chemical Formula:	C ₃ H ₄ Cl ₂

4. FIRST-AID MEASURES**Inhalation:**

May cause coughing, difficult breathing and nausea. Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Inhalation of vapors or contact with substance will result in contamination and potential harmful effects. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact:

Immediately call a poison center or doctor. Effects of exposure (skin contact) to substance may be delayed. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact:

IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion:

Toxic if swallowed. Do not induce vomiting with out medical advice. Effects of exposure (ingestion) to substance may be delayed. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:**Acute:**

Redness.

Delayed:

May cause skin sensitization. Possibly carcinogenic to humans.

4. FIRST-AID MEASURES**Immediate medical attention:**

WARNING: It might be dangerous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is toxic. CAUTION: Victim may be a source of contamination. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES**Suitable extinguishing media:**

Dry chemical, CO₂ or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical**Hazardous combustion products:**

These products include: Carbon oxides Halogenated compounds

Other specific hazards:

WARNING: Highly toxic HCl gas is produced during combustion.

Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. Do not use straight streams. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES**Personal precautions:**

Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Use spark-proof tools and explosion-proof equipment. Remove all sources of ignition. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment:

Wear eye protection (splash goggles) and face protection (full length face shield). Wear protective clothing (chemical resistant suit and chemical resistant boots). Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

Emergency procedures:

Isolate area until gas has dispersed. Do not clean-up or dispose except under supervision of a specialist. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and exercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). All equipment used when handling the product must be grounded. Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material.

Environmental precautions:

Keep away from living quarters. Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

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

Do NOT breath gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Do not ingest. Avoid contact with skin and eyes. Avoid contact with skin. Avoid exposure - obtain special instructions before use. Avoid prolonged or repeated exposure. Normal measures for preventive fire protection. Keep away from heat and sources of ignition. Use explosion-proof equipment. Use only non-sparking hand tool when handling this product. Ground all equipment containing material. Take measures to prevent build up of electrostatic charge. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage:

Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from sources of ignition. Store and use away from heat, sparks, open flame, or any other ignition source. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods. Store under inert gas (e.g. Argon). Store in a freezer.

Storage incompatibilities:

Combustible substances, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION**Exposure limits:**

No data available

8. EXPOSURE CONTROLS / PERSONAL PROTECTION**Appropriate engineering controls:**

Handle only in a fully enclosed system and equipment. Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection:	Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection:	Wear protective gloves.
Eye protection:	Splash goggles.
Skin and body protection:	Wear protective clothing (chemical resistant suit and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C):	Liquid
Form:	Clear
Color:	Colorless - Pale yellow
Odor:	Pungent
Odor threshold:	No data available

Melting point/freezing point:	No data available	pH:	No data available
Boiling point/range:	112°C (234°F)	Vapor pressure:	No data available
Decomposition temperature:	No data available	Vapor density:	No data available
Relative density:	1.22	Dynamic Viscosity:	No data available
Kinematic Viscosity:	No data available		
Partition coefficient: n-octanol/water (log P_{ow})	1.41	Evaporation rate: (Butyl Acetate = 1)	No data available
Flash point:	21°C (70°F)	Autoignition temperature:	No data available
Flammability (solid, gas):	No data available	Flammability or explosive limits:	
		Lower:	5.3%
		Upper:	14.5%

Solubility(ies):

Water: Very slightly soluble
Soluble: Ether, Benzene, Chloroform

10. STABILITY AND REACTIVITY

Reactivity:	Not Available.
Chemical Stability:	Air sensitive. Heat sensitive.
Possibility of Hazardous Reactions:	In use, may form flammable/explosive vapor-air mixture.
Conditions to avoid:	Air sensitive. Exposure to air. Heat sensitive.
Incompatible materials:	Oxidizing agents
Hazardous Decomposition Products:	No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: UC8320000

Acute Toxicity:

No data available

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

mmo-sat 20 ug/plate(+/-S9)

dns-hmn-hla 100 umol/L

Carcinogenicity:

No data available

IARC: Group 2B (Possibly carcinogenic to humans) .**NTP:** b (Reasonably anticipated to be carcinogens).**OSHA:** No data available**Reproductive toxicity:**

No data available

Routes of Exposure:

Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Overexposure may result in serious illness or death. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Skin contact may result in redness, pain or dry skin. Eye contact may result in redness or pain. Skin contact may result in sensitization. Readily absorbed through skin.

Potential Health Effects:

Skin and eye contact may result in irritation.

Target organ(s):

May cause damage to organs: Respiratory System

May cause damage to organs: Digestive Tract through prolonged or repeated exposure.

12. ECOLOGICAL INFORMATION**Ecotoxicity**

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

Persistence and degradability:

No data available

Bioaccumulative potential (BCF):

<2.5(conc. 34.6 ug/L), <26(conc. 26 ug/L)

Mobility in soil:

No data available

Partition coefficient:

1.41

n-octanol/water (log P_{ow})**Soil adsorption (K_{oc}):**

No data available

Henry's Law:

No data available

constant (PaM³/mol)**13. DISPOSAL CONSIDERATIONS****Disposal of product:**

Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.

Disposal of container:

Dispose of as unused product. Do not re-use empty containers.

Other considerations:

Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION**DOT (US)****UN number:**
UN2047**Proper Shipping Name:**
Dichloropropenes**Class or Division:**
3 Flammable liquid**Packing Group:**
II**IATA****UN number:**
UN2047**Proper Shipping Name:**
Dichloropentanes**Class or Division:**
3 Flammable liquid**Packing Group:**
II**IMDG****UN number:**
UN2047**Proper Shipping Name:**
Dichloropropenes**Class or Division:**
3 Flammable liquid**Packing Group:**
II**EmS number:**

F-E, S-D

Reportable Quantity:

100 Pounds (45.4 Kilograms)

15. REGULATORY INFORMATION

15. REGULATORY INFORMATION**Toxic Substance Control Act (TSCA 8b.):**

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations**CERCLA Hazardous substance and Reportable Quantity:**

SARA 313:	Listed
SARA 302:	Not Listed

State Regulations**State Right-to-Know**

Massachusetts	Listed
New Jersey	Not Listed
Pennsylvania	Listed
California Proposition 65:	Not Listed

Other Information**NFPA Rating:**

Health:	2
Flammability:	3
Instability:	0

HMIS Classification:

Health:	2
Flammability:	3
Physical:	0

International Inventories**WHMIS hazard class:**

B2: Flammable Liquid.
D1B: Materials causing immediate and serious toxic effects. (Toxic)
D2B: Materials causing other toxic effects. (Toxic)

16. OTHER INFORMATION

Revision date: 08/15/2016

Revision number: 4

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.


TRICHLOROETHYLENE**ICSC: 0081 (April 2013)**

1,1,2-Trichloroethylene
 Trichloroethene
 Ethylene trichloride
 Acetylene trichloride
 Tri
 Chlorylen
 TCE
 Trilene
 Trichlor

CAS #: 79-01-6**UN #: 1710****EC Number: 201-167-4**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. See Notes. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks and NO smoking. NO contact with hot surfaces, strong bases or finely divided metals. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS! AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Weakness. Nausea. Unconsciousness.	Use closed system.	Fresh air, rest. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Sore throat. Aspiration hazard! See Inhalation. Cardiac dysrhythmia. Respiratory arrest.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance and complete protective clothing. Ventilation. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>May be harmful if swallowed Causes skin irritation Causes serious eye irritation Suspected of causing genetic defects May cause cancer May cause drowsiness or dizziness May be harmful if swallowed and enters airways Harmful to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III</p>
STORAGE	
Separated from metals, strong bases, food and feedstuffs, combustible substances and ignition sources. See Chemical Dangers. Dry. Keep in the dark. Keep in a well-ventilated room. Cool.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.



International
Labour
Organization



World Health
Organization

© ILO and WHO 2021



European
Commission

TRICHLOROETHYLENE

ICSC: 0081

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive fumes of phosgene and hydrogen chloride. Decomposes on contact with strong alkali. This produces dichloroacetylene. This increases fire hazard. Reacts violently with finely divided metals. This generates fire and explosion hazard. Slowly decomposed by light in the presence of moisture. This produces corrosive hydrochloric acid.

Formula: C_2HCl_3 / $ClCH=CCl_2$

Molecular mass: 131.4

Boiling point: 87°C

Melting point: -86°C

Relative density (water = 1): 1.5 (20°C)

Solubility in water, g/100ml at 20°C: 0.1

Vapour pressure, kPa at 20°C: 7.8

Relative vapour density (air = 1): 4.5

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.3

Auto-ignition temperature: 410°C

Explosive limits, vol% in air: 7.9 - 100

Octanol/water partition coefficient as log Pow: 2.42

Electrical conductivity: 800 pS/m

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation, by ingestion and through the skin.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis. The substance may cause effects on the central nervous system, liver and kidneys. This may result in impaired functions. Exposure at high concentrations could cause unconsciousness.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the central nervous system. This may result in fatigue, irritability and mental and memory disturbances. The substance may have effects on the liver, kidneys and immune system. This substance is carcinogenic to humans. Causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; 25 ppm as STEL; A2 (suspected human carcinogen); BEI issued.

MAK: skin absorption (H); carcinogen category: 1; germ cell mutagen group: 3B.

EU-OEL: 54.7 mg/m³, 10 ppm as TWA; 164.1 mg/m³, 30 ppm as STEL; (skin)

ENVIRONMENT

The substance is harmful to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions.

Use of alcoholic beverages enhances the harmful effect.

Depending on the degree of exposure, periodic medical examination is suggested.

The odour warning when the exposure limit value is exceeded is insufficient.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION

EC Classification

Symbol: T; R: 45-36/38-52/53-67; S: 53-45-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

TRICHLOROFLUOROMETHANE**ICSC: 0047 (July 2002)**

Trichloromonofluoromethane
 Fluorotrichloromethane
 CFC 11
 R 11

CAS #: 75-69-4**EC Number: 200-892-3**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Irregular heartbeat. Confusion. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE. Dry skin.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Ventilation.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Separated from incompatible materials. See Chemical Dangers. Cool.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021



European
Commission

TRICHLOROFLUOROMETHANE

ICSC: 0047

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS GAS OR HIGHLY VOLATILE LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The gas is heavier than air. The vapour is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases of hydrogen chloride (see ICSC 0163), phosgene (see ICSC 0007), hydrogen fluoride (see ICSC 0283) and carbonyl fluoride (see ICSC 0633). Reacts with powdered aluminium, powdered zinc, magnesium shavings, lithium shavings and granular barium.

Formula: CCl_3F

Molecular mass: 137.4

Boiling point: 24°C

Melting point: -111°C

Relative density (water = 1): 1.49

Solubility in water, g/100ml at 20°C: 0.1

Vapour pressure, kPa at 20°C: 89.0

Relative vapour density (air = 1): 4.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 4.4

Octanol/water partition coefficient as log Pow: 2.53

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation.

Effects of short-term exposure

The liquid may cause frostbite. The substance may cause effects on the cardiovascular system and central nervous system. This may result in cardiac disorders and central nervous system depression. Exposure could cause lowering of consciousness. See Notes.

Inhalation risk

On loss of containment this substance can cause suffocation by lowering the oxygen content of the air in confined areas.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1000 ppm as STEL; A4 (not classifiable as a human carcinogen).

MAK: 5700 mg/m³, 1000 ppm; peak limitation category: II(2); pregnancy risk group: C

ENVIRONMENT

Avoid release to the environment because of its impact on the ozone layer.

NOTES

High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death.

Check oxygen content before entering area.

The occupational exposure limit value should not be exceeded during any part of the working exposure.

The odour warning when the exposure limit value is exceeded is insufficient.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

ADDITIONAL INFORMATION

EC Classification

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE**ICSC: 0050 (July 2002)**

Trichlorotrifluoroethane

CFC 113

R 113

CAS #: 76-13-1**EC Number: 200-936-1**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Irregular heartbeat. Confusion. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Separated from metals and alloys. See Chemical Dangers. Cool. Ventilation along the floor.	
PACKAGING	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE**ICSC: 0050****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS VOLATILE LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases of hydrogen chloride (see ICSC 0163), phosgene (see ICSC 0007), hydrogen fluoride (see ICSC 0283) and carbonyl fluoride (see ICSC 0633). Reacts violently with powdered metals. This generates fire and explosion hazard. Attacks magnesium and its alloys.

Formula: C₂Cl₃F₃ / Cl₂FCCClF₂

Molecular mass: 187.4

Boiling point: 48°C

Melting point: -36°C

Relative density (water = 1): 1.56

Solubility in water, g/100ml at 20°C: 0.02

Vapour pressure, kPa at 20°C: 36

Relative vapour density (air = 1): 6.5

Relative density of the vapour/air-mixture at 20°C (air = 1): 3.0

Auto-ignition temperature: 680°C

Octanol/water partition coefficient as log Pow: 3.30

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes. The substance may cause effects on the cardiovascular system and central nervous system. This may result in cardiac disorders and central nervous system depression. Exposure could cause lowering of consciousness. See Notes.

Inhalation risk

On loss of containment this substance can cause suffocation by lowering the oxygen content of the air in confined areas.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1000 ppm as TWA; 1250 ppm as STEL; A4 (not classifiable as a human carcinogen).

MAK: 3900 mg/m³, 500 ppm; peak limitation category: II(2); pregnancy risk group: D**ENVIRONMENT**

The substance is toxic to aquatic organisms. Avoid release to the environment because of its impact on the ozone layer.

NOTES

High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death.

Check oxygen content before entering area.

The odour warning when the exposure limit value is exceeded is insufficient.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

VINYL CHLORIDE**ICSC: 0082 (April 2017)**


Chloroethene
Chloroethylene
Vinylchloride Monomer (VCM)

CAS #: 75-01-4**UN #: 1086 (stabilized)****EC Number: 200-831-0**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Extremely flammable. Gives off irritating or toxic fumes (or gases) in a fire. Gas/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking handtools.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with powder, carbon dioxide, water spray. See Notes. In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Unconsciousness. Blurred vision. Numbness. Tingling sensation.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Protective gloves. Cold-insulating gloves. Protective clothing.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer immediately for medical attention.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Ventilation. Remove all ignition sources. Remove vapour cloud with fine water spray. NEVER direct water jet on liquid.	<p>According to UN GHS Criteria</p>  <p>DANGER</p> <p>Extremely flammable gas Contains gas under pressure; may explode if heated May cause drowsiness or dizziness May cause damage to liver through prolonged or repeated exposure Suspected of causing genetic defects May cause cancer</p> <p>Transportation UN Classification UN Hazard Class: 2.1</p>
STORAGE	
Fireproof. Separated from : see Chemical Dangers. Cool. Store only if stabilized. Well closed. Keep in a well-ventilated room. Separated from oxidizing materials.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

VINYL CHLORIDE

ICSC: 0082

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS COMPRESSED LIQUEFIED GAS WITH CHARACTERISTIC ODOUR.

Physical dangers

The gas is heavier than air and may travel along the ground; distant ignition possible. Vapours are uninhibited and may polymerize, causing blockage of vents.

Chemical dangers

The substance can form explosive peroxides under specific circumstances. The substance readily polymerizes due to heating and under the influence of air, light and on contact with a catalyst, strong oxidizing agents and metals such as copper and aluminium. This generates fire or explosion hazard. Decomposes on burning. This produces toxic and corrosive fumes of hydrogen chloride and phosgene. Attacks iron and steel in the presence of moisture.

Formula: C_2H_3Cl / $H_2C=CHCl$

Molecular mass: 62.5

Boiling point: -13°C

Melting point: -154°C

Relative density (water = 1): 0.9 (liquid)

Density (vapour at 15°C): 8 g/l

Solubility in water, g/l at 25°C: 1.1 (poor)

Relative vapour density (air = 1): 2.2

Vapour pressure, kPa at 20°C: 334

Flash point: -78°C c.c.

Auto-ignition temperature: 472°C

Explosive limits, vol% in air: 3.6-33

Octanol/water partition coefficient as log Pow: 1.6

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation.

Effects of short-term exposure

The liquid may cause frostbite. The substance is irritating to the eyes. The substance may cause effects on the central nervous system. This may result in lowering of consciousness, convulsions and seizures. Medical observation is indicated.

Inhalation risk

A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

Effects of long-term or repeated exposure

The substance may have effects on the liver, spleen, blood, peripheral blood vessels and tissue and bones of the fingers. Animal tests show that this substance possibly causes toxicity to human reproduction or development. This substance is carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1 ppm as TWA; A1 (confirmed human carcinogen).

EU-OEL: 2.6 mg/m³, 1 ppm as TWA.

MAK: carcinogen category: 1

ENVIRONMENT

This substance may be hazardous to the environment. Special attention should be given to ground water contamination.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

The odour warning when the exposure limit value is exceeded is insufficient.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

Large fires of this material are practically inextinguishable: use water spray or fog.

ADDITIONAL INFORMATION

EC Classification

Symbol: F+, T; R: 45-12; S: 53-45; Note: D

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.


BIPHENYL**ICSC: 0106 (October 2006)**

Diphenyl
Phenylbenzene
Dibenzene

CAS #: 92-52-4**UN #: 3077****EC Number: 202-163-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust. Prevent build-up of electrostatic charges (e.g., by grounding).	Use water spray, foam, powder, carbon dioxide.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Nausea. Vomiting.	Avoid inhalation of dust and mist. Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection if powder.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible).
Ingestion	Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
<p>Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.</p>	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>WARNING</p> </div> <p>Causes eye irritation May cause damage to liver and nervous system through prolonged or repeated exposure if inhaled Very toxic to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III</p>
STORAGE	
Separated from food and feedstuffs and oxidants. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

BIPHENYL

ICSC: 0106

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

WHITE CRYSTALS OR FLAKES WITH CHARACTERISTIC ODOUR.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

Reacts with oxidants.

Formula: C₁₂H₁₀ / C₆H₅C₆H₅

Molecular mass: 154.2

Boiling point: 256°C

Melting point: 70°C

Relative density (water = 1): 1.04

Solubility in water, g/100ml at 20°C: 0.0004

Vapour pressure, Pa at 25°C: 1.19

Relative vapour density (air = 1): 5.3

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0

Flash point: 113°C c.c.

Auto-ignition temperature: 540°C

Explosive limits, vol% in air: 0.6 (at 111°C) - 5.8 (at 166°C)

Octanol/water partition coefficient as log Pow: 3.16/4.09

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

The substance may have effects on the liver and nervous system. This may result in impaired functions.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.2 ppm as TWA.

MAK: skin absorption (H); carcinogen category: 3

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur along the food chain, for example in plants. It is strongly advised not to let the chemical enter into the environment.

NOTES

Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification

Symbol: Xi, N; R: 36/37/38-50/53; S: (2)-23-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,2,4,5-TETRACHLOROBENZENE**ICSC: 0676 (November 2003)**Benzene tetrachloride
s-Tetrachlorobenzene**CAS #: 95-94-3****EC Number: 202-466-2**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with oxidizing agents.	NO open flames.	Use powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use local exhaust.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: P2 filter respirator for harmful particles. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Separated from strong oxidants.	
PACKAGING	



World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European Commission

1,2,4,5-TETRACHLOROBENZENE**ICSC: 0676****PHYSICAL & CHEMICAL INFORMATION**

Physical State; Appearance
COLOURLESS CRYSTALS.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride. Reacts with strong oxidants.

Formula: C₆H₂Cl₄

Molecular mass: 215.9

Boiling point: 243-246°C

Melting point: 139-140°C

Density: 1.83 g/cm³

Solubility in water, mg/l at 25°C: 2.16

Vapour pressure, Pa at 25°C: 0.7

Relative vapour density (air = 1): 7.4

Flash point: 155°C c.c.

Octanol/water partition coefficient as log Pow: 4.9

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Effects of short-term exposure**Inhalation risk**

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying or when dispersed, especially if powdered.

Effects of long-term or repeated exposure

The substance may have effects on the liver. This may result in liver impairment.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

Health effects of exposure to the substance have not been investigated adequately.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,2,4-TRICHLOROBENZENE**ICSC: 1049 (November 2003)**1,2,4-Trichlorobenzol
unsym-Trichlorobenzene**CAS #: 120-82-1****UN #: 2321****EC Number: 204-428-0**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, foam, carbon dioxide.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness. Roughness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Sore throat. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. If solid: sweep spilled substance into sealable containers. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Separated from strong oxidants, acids and food and feedstuffs.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

1,2,4-TRICHLOROBENZENE**ICSC: 1049****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID OR WHITE CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces toxic fumes including hydrogen chloride. Reacts violently with oxidants.

Formula: C₆H₃Cl₃

Molecular mass: 181.5

Boiling point: 213°C

Melting point: 17°C

Relative density (water = 1): 1.5

Solubility in water, mg/l: 34.6

Vapour pressure, Pa at 25°C: 40

Relative vapour density (air = 1): 6.26

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.002

Flash point: 105°C c.c.

Auto-ignition temperature: 571°C

Explosive limits, vol% in air: 2.5-6.6 (at 150°C)

Octanol/water partition coefficient as log Pow: 3.98

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the liver.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as STEL.

MAK: skin absorption (H); carcinogen category: 3.

EU-OEL: 15.1 mg/m³, 2 ppm as TWA; 37.8 mg/m³, 5 ppm as STEL; (skin)**ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

The occupational exposure limit value should not be exceeded during any part of the working exposure. See ICSCs 0344 and 1222.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn, N; R: 22-38-50/53; S: (2)-23-37/39-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,2-DICHLOROBENZENE**ICSC: 1066 (November 2003)**

ortho-Dichlorobenzene

CAS #: 95-50-1**UN #: 1591****EC Number: 202-425-9**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Above 66°C explosive vapour/air mixtures may be formed.	NO open flames. Above 66°C use a closed system and ventilation.	Use water spray, powder, foam, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Drowsiness. Sore throat. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain. Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Separated from aluminium, oxidants and food and feedstuffs.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

1,2-DICHLOROBENZENE**ICSC: 1066****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS-TO-YELLOW LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces toxic and corrosive gases including hydrogen chloride. Reacts with aluminium and oxidants. Attacks plastics and rubber.

Formula: C₆H₄Cl₂

Molecular mass: 147.0

Boiling point: 180-183°C

Melting point: -17°C

Relative density (water = 1): 1.3

Solubility in water: very poor

Vapour pressure, kPa at 20°C: 0.16

Relative vapour density (air = 1): 5.1

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.006

Flash point: 66°C c.c.

Auto-ignition temperature: 648°C

Explosive limits, vol% in air: 2.2-9.2

Octanol/water partition coefficient as log Pow: 3.38

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system and liver. Exposure could cause lowering of consciousness.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the kidneys and blood.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 25 ppm as TWA; 50 ppm as STEL; A4 (not classifiable as a human carcinogen).

MAK: 61 mg/m³, 10 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: C.EU-OEL: 122 mg/m³, 20 ppm as TWA; 306 mg/m³, 50 ppm as STEL; (skin)**ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. It is strongly advised not to let the chemical enter into the environment.

NOTES**ADDITIONAL INFORMATION****EC Classification**

Symbol: Xn, N; R: 22-36/37/38-50/53; S: (2)-23-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,2-DIPHENYLHYDRAZINE**ICSC: 0263 (April 2005)**

Hydrazobenzene
Diphenylhydrazine
N,N'-Bianiline

CAS #: 122-66-7**EC Number: 204-563-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, foam, carbon dioxide.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Separated from food and feedstuffs. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

1,2-DIPHENYLHYDRAZINE**ICSC: 0263****PHYSICAL & CHEMICAL INFORMATION**

Physical State; Appearance
WHITE-TO-YELLOW CRYSTALS.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces toxic fumes including nitrogen oxides. Reacts with mineral acids. This produces benzidine (see ICSC 0224).

Formula: $C_{12}H_{12}N_2$ / $C_6H_5NHNHC_6H_5$
Molecular mass: 184.3
Decomposes at 125-131°C
Density: 1.16 g/cm³
Solubility in water, g/100ml at 20°C: <0.1 (poor)
Octanol/water partition coefficient as log Pow: 2.94

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

May cause mechanical irritation.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

This substance is probably carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

MAK: carcinogen category: 2

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

Do NOT take working clothes home.
Depending on the degree of exposure, periodic medical examination is suggested.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 45-22-50/53; S: 53-45-60-61; Note: E

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,3-DICHLOROBENZENE**ICSC: 1095 (April 2000)**m-Dichlorobenzene
m-Phenylene dichloride**CAS #: 541-73-1****UN #: 2810****EC Number: 208-792-1**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 63°C explosive vapour/air mixtures may be formed.	NO open flames. Above 63°C use a closed system and ventilation.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Drowsiness. Nausea. Sore throat. Vomiting. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Provision to contain effluent from fire extinguishing. Separated from strong oxidants, aluminium and food and feedstuffs. Well closed. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

1,3-DICHLOROBENZENE**ICSC: 1095****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**
COLOURLESS LIQUID.**Physical dangers**

The vapour is heavier than air.

Chemical dangers

Decomposes on burning. This produces toxic fumes including hydrogen chloride. Reacts with strong oxidants. Reacts violently with aluminium.

Formula: C₆H₄Cl₂

Molecular mass: 147.00

Boiling point: 173°C

Melting point: -24.8°C

Relative density (water = 1): 1.288

Solubility in water: none

Vapour pressure, kPa at 25°C: 0.286

Relative vapour density (air = 1): 5.1

Flash point: 63°C

Octanol/water partition coefficient as log Pow: 3.53

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

The vapour is irritating to the eyes, skin and respiratory tract. See Notes.

Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

The substance may have effects on the kidneys and liver. See Notes.

OCCUPATIONAL EXPOSURE LIMITSMAK: 12 mg/m³, 2 ppm; peak limitation category: II(2); pregnancy risk group: C**ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTESData on the toxicity of m-dichlorobenzene are limited.
See ICSCs 0037 and 1066.**ADDITIONAL INFORMATION****EC Classification**


Symbol: Xn, N; R: 22-51/53; S: (2)-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,4-DICHLOROBENZENE**ICSC: 0037 (May 2018)**p-Dichlorobenzene
PDCB**CAS #: 106-46-7****UN #: 3077****EC Number: 203-400-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 66°C explosive vapour/air mixtures may be formed. Finely dispersed particles form explosive mixtures in air.	NO open flames. Above 66°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Drowsiness. Headache. Nausea. Shortness of breath. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Diarrhoea. Further see Inhalation.	Do not eat, drink, or smoke during work.	Give one or two glasses of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  WARNING Harmful if swallowed Causes serious eye irritation Suspected of causing cancer Very toxic to aquatic life with long lasting effects Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III
STORAGE	
Separated from strong oxidants and food and feedstuffs. Provision to contain effluent from fire extinguishing. Keep in a well-ventilated room. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

1,4-DICHLOROBENZENE**ICSC: 0037****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS-TO-WHITE CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

On combustion, forms toxic and corrosive fumes including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Upon heating, toxic fumes are formed. Reacts with strong oxidants. This generates fire and explosion hazard.

Formula: $C_6H_4Cl_2$

Molecular mass: 147

Boiling point: 174°C

Melting point: 53°C

Density: 1.2 g/cm³

Solubility in water, mg/l at 20°C: 49 (practically insoluble)

Vapour pressure, Pa at 20°C: 170

Relative vapour density (air = 1): 5.08

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01

Flash point: 66°C c.c.

Explosive limits, vol% in air: 1.7-5.9

Octanol/water partition coefficient as log Pow: 3.37

Auto-ignition temperature: 640°C

Viscosity: 0.73 mPa*s at 70°C

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, respiratory tract and skin. The substance may cause effects on the blood. This may result in haemolytic anaemia. The substance may cause effects on the central nervous system.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance may have effects on the liver, central nervous system, blood and lungs. This may result in liver function impairment, neuropathy and anaemia. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 12 mg/m³, 2 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.

EU-OEL: 12 mg/m³, 2 ppm as TWA; 60 mg/m³, 10 ppm as STEL; (skin)

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

Do NOT take working clothes home.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn, N; R: 36-40-50/53; S: (2)-36/37-46-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

2,3,4,6-TETRACHLOROPHENOL**ICSC: 1089 (October 2005)**2,4,5,6-Tetrachlorophenol
Phenol, 2,3,4,6-tetrachloro-**CAS #: 58-90-2****UN #: 2020****EC Number: 200-402-8**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, alcohol-resistant foam, dry powder, carbon dioxide.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Shortness of breath. Convulsions.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Headache. Dizziness. Vomiting. Weakness. Convulsions. Muscle spasms. Fever. Sweating. See Notes.	Do not eat, drink, or smoke during work. Wash hands before eating.	Give a slurry of activated charcoal in water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit and particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

2,3,4,6-TETRACHLOROPHENOL**ICSC: 1089****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

BROWN SOLID IN VARIOUS FORMS WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Decomposes on heating. This produces corrosive fumes including hydrogen chloride.

Formula: C₆H₂Cl₄O

Molecular mass: 231.9

Melting point: 70°C

Density: 1.8 g/cm³

Solubility in water, g/100ml at 20°C: 0.1 (very poor)

Flash point: 100°C

Octanol/water partition coefficient as log Pow: 4.45

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. See Notes.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

The substance may have effects on the liver. The substance may have effects on the skin. This may result in chloracne. See Notes.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

2,3,4,6-Tetrachlorophenol is a polychlorophenol which, as a group, has been classified by IARC (1999) as possibly carcinogenic to humans, but the data on this specific substance are inconclusive.

No data are available on this isomer but a mixture of tetrachlorophenols may cause irritation of the skin, eyes and respiratory tract.

These substances may cause acute metabolic effects resulting in damage in several organs notably in central nervous system.

Some technical products may contain highly toxic impurities including polychlorinated dibenzo-p-dioxins and furans.

Depending on the degree of exposure, periodic medical examination is suggested.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 25-36/38-50/53; S: (1/2)-26-28-37-45-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

2,4,5-TRICHLOROPHENOL**ICSC: 0879 (April 2014)**


2,4,5-TCP

1-Hydroxy-2,4,5-trichlorobenzene

CAS #: 95-95-4**UN #: 2020****EC Number: 202-467-8**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames. NO contact with strong oxidizing agents.	Use foam, powder, carbon dioxide.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. To remove substance use polyethylene glycol 300 or vegetable oil. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Dizziness. Headache. Vomiting. Fatigue. Sweating.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>WARNING</p> </div> <p>Harmful if swallowed Causes skin irritation Causes serious eye irritation May cause respiratory irritation Very toxic to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III</p>
STORAGE	
Separated from strong oxidants and food and feedstuffs. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

2,4,5-TRICHLOROPHENOL**ICSC: 0879****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS-TO-YELLOW CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

May explode on heating to decomposition. Decomposes on heating and on contact with strong oxidants. This produces toxic and irritating fumes (chlorine, hydrochloric acid). The substance is a weak acid. Reacts in an alkaline medium at high temperatures producing highly toxic chlorinated dioxins.

Formula: $C_6H_3Cl_3O$ / $C_6H_2Cl_3(OH)$

Molecular mass: 197.5

Boiling point: 253°C

Melting point: 67°C

Density: 1.68 g/cm³

Relative vapour density (air = 1): 6.8

Solubility in water, g/l at 20°C: 1.2 (poor)

Flash point: 133°C c.c.

Vapour pressure, Pa at 25°C: 2.9

Octanol/water partition coefficient as log Pow: 3.7

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by ingestion.

Effects of short-term exposure

The substance is severely irritating to the eyes, skin and respiratory tract.

Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached when dispersed.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidneys. See Notes.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT**

The substance is very toxic to aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

Some technical products may contain highly toxic impurities including polychlorinated dibenzo-p-dioxins and furans.

Depending on the degree of exposure, periodic medical examination is suggested.

If the substance is formulated with solvent(s) also consult the card(s) (ICSC) of the solvent(s).

Carrier solvents used in commercial formulations may change physical and toxicological properties.

See ICSCs 588, 589, 590 and 1122.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn, N; R: 22-36/38-50/53; S: (2)-26-28-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.


2,4,6-TRICHLOROPHENOL**ICSC: 1122 (November 2019)**

2,4,6-TCP

CAS #: 88-06-2**UN #: 2020****EC Number: 201-795-9**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.		Use foam, dry powder, carbon dioxide.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use ventilation (not if powder), local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. To remove substance use polyethylene glycol 300 or vegetable oil. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Vomiting. Burning sensation. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>WARNING</p> </div> <p>Harmful if swallowed Causes skin irritation Causes serious eye irritation May cause respiratory irritation Suspected of causing cancer Very toxic to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III</p>
STORAGE	
Provision to contain effluent from fire extinguishing. Separated from strong oxidants and food and feedstuffs. Well closed. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

2,4,6-TRICHLOROPHENOL**ICSC: 1122****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS-TO-YELLOW CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Decomposes on heating. This produces toxic and corrosive fumes including hydrogen chloride and chlorine. Reacts with strong oxidants.

Formula: C₆H₃Cl₃O / C₆H₂Cl₃OH

Molecular mass: 197.5

Boiling point: 246°C

Melting point: 69°C

Density (at 25°C): 1.7 g/cm³

Solubility in water, g/l at 20°C: 0.8 (very poor)

Vapour pressure, Pa at 76.5°C: 133

Flash point: 99°C c.c.

Octanol/water partition coefficient as log Pow: 3.7

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body through the skin and by ingestion.

Effects of short-term exposure

The substance is severely irritating to the eyes, skin and respiratory tract.

Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached when dispersed.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis including chloracne. The substance may have effects on the liver. This may result in impaired functions. This substance is possibly carcinogenic to humans. Tumours have been detected in experimental animals but may not be relevant to humans.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT**

The substance is very toxic to aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

Some technical products may contain highly toxic impurities including polychlorinated dibenzo-p-dioxins and furans. See ICSCs 0588, 0589, 0590 and 879.

ADDITIONAL INFORMATION**EC Classification**

H302; H315; H319; H351; H400; H410

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

2,4-DICHLOROPHENOL**ICSC: 0438 (May 2010)**

2,4-DCP

2,4-Dichlorohydroxybenzene


1-Hydroxy-2,4-dichlorobenzene

CAS #: 120-83-2**UN #: 2020****EC Number: 204-429-6**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air.	NO open flames. Prevent build-up of electrostatic charges (e.g., by grounding).	Use water spray, foam, powder, carbon dioxide.

PREVENT DISPERSION OF DUST! PREVENT GENERATION OF MISTS! AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Burning sensation behind the breastbone. Shortness of breath. Laboured breathing. Further see Ingestion.	Use local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain. Blisters. Further see Inhalation.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. See Notes. To remove substance use polyethylene glycol 400 or vegetable oil. Rinse skin with plenty of water or shower. Refer immediately for medical attention.
Eyes	Redness. Pain. Severe burns.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Burns in mouth and throat. Abdominal pain. Tremor. Convulsions. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p>  <p align="center">DANGER</p> <p>Harmful if swallowed Toxic in contact with skin Causes severe skin burns and eye damage Causes damage to central nervous system May cause damage to the respiratory system if inhaled Toxic to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III</p>
STORAGE	
Fireproof. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing. Separated from strong oxidants and food and feedstuffs. Ventilation along the floor.	
PACKAGING	
Do not transport with food and feedstuffs.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021

European
Commission

2,4-DICHLOROPHENOL**ICSC: 0438****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc.

Chemical dangers

Decomposes on heating. This produces toxic fumes including chlorine and hydrogen chloride. Decomposes on burning. This produces toxic fumes including phosgene and dioxins. Reacts violently with acids and strong oxidants.

Formula: C₆H₄Cl₂O

Molecular mass: 163.0

Boiling point: 210.0°C

Melting point: 45.0°C

Density: 1.4 g/cm³

Solubility in water, g/100ml at 20°C: 0.45 (poor)

Vapour pressure, Pa at 20°C: 10

Relative vapour density (air = 1): 5.6

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 113°C o.c.

Auto-ignition temperature: 500°C

Octanol/water partition coefficient as log Pow: 3.17

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion. Serious local effects by all routes of exposure.

Effects of short-term exposure

The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. The hot liquid may cause severe skin burns. Exposure to the molten substance may result in extensive skin absorption and rapid death. Inhalation of the vapour may cause lung oedema. See Notes. Medical observation is indicated. The substance may cause effects on the central nervous system.

Inhalation risk

A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C; when in molten form, however, evaporation will be much faster.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS****ENVIRONMENT**

The substance is toxic to aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Isolate contaminated clothing by sealing in a bag or other container.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 22-24-34-51/53; S: (1/2)-26-36/37/39-45-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

2,4-XYLENOL**ICSC: 0458 (July 2003)**

2,4-Dimethylphenol
m-Xylenol
1-Hydroxy-2,4-dimethylbenzene

CAS #: 105-67-9**UN #: 2261****EC Number: 203-321-6**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, alcohol-resistant foam, carbon dioxide.

PREVENT DISPERSION OF DUST! PREVENT GENERATION OF MISTS! STRICT HYGIENE!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Burning sensation. Cough. Sore throat. Shortness of breath. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	Redness. Pain. Skin burns.	Protective clothing. Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain. Severe burns.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Nausea. Vomiting. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
<p>Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. If liquid: collect leaking liquid in covered plastic containers.</p>	<p>According to UN GHS Criteria</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II</p>
STORAGE	
Separated from food and feedstuffs, acid anhydrides, acid chlorides, bases and oxidants.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

2,4-XYLENOL**ICSC: 0458****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

YELLOW-TO-BROWN LIQUID OR COLOURLESS CRYSTALS.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces toxic gases and irritating fumes.
 Reacts with acid anhydrides, acid chlorides, bases and oxidants.

Formula: $C_8H_{10}O$ / $(CH_3)_2C_6H_3OH$

Molecular mass: 122.17

Boiling point: 211.5°C

Melting point: 25.4-26°C

Density: 0.97 g/cm³

Solubility in water, g/100ml at 25°C: 0.79

Vapour pressure, Pa at 20°C: 8

Flash point: >112°C c.c.

Auto-ignition temperature: 599°C

Explosive limits, vol% in air: 1.1-6.4

Octanol/water partition coefficient as log Pow: 2.3

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, by ingestion and through the skin.

Effects of short-term exposure

The substance is corrosive to the skin, respiratory tract and eyes.
 Corrosive on ingestion. Inhalation of the aerosol may cause lung oedema. See Notes.

Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (inhalable fraction and vapour): 1 ppm as TWA; (DSEN); A3 (confirmed animal carcinogen with unknown relevance to humans)

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort.

Rest and medical observation are therefore essential.

Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 24/25-34-51/53; S: (1/2)-26-36/37/39-45-61; Note: C

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

2,4-DINITROPHENOL**ICSC: 0464 (June 2015)**


Phenol, 2,4-dinitro
1-Hydroxy-2,4-dinitrobenzene

CAS #: 51-28-5**UN #: 1320 (see Notes)****EC Number: 200-087-7**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion.	NO open flames, NO sparks and NO smoking. Do NOT expose to friction or shock. Use non-sparking handtools. Prevent deposition of dust. Closed system, dust explosion-proof electrical equipment and lighting.	Use water in large amounts. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	See Ingestion.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin	MAY BE ABSORBED! Redness. Roughness. Yellow staining of the skin. Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer immediately for medical attention.
Eyes	Yellow vision. Redness. Conjunctivitis.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Nausea. Sweating. Severe thirst. Fever. Increased heart rate. Vomiting. Shock or collapse.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rest. Refer immediately for medical attention. See Notes.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do not allow to dry out. Do NOT let this chemical enter the environment. Sweep spilled substance into containers. Carefully collect remainder. Store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  </div> <p>DANGER</p> <p>Fatal if swallowed Toxic in contact with skin May cause damage to organs through prolonged or repeated exposure Very toxic to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 4.1; UN Subsidiary Risks: 6.1; UN Pack Group: I</p>
STORAGE	
Fireproof. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing. Cool. Separated from combustible substances, reducing agents and food and feedstuffs.	
PACKAGING	
Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Marine pollutant.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



2,4-DINITROPHENOL**ICSC: 0464****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

May decompose explosively on shock, friction or concussion. May explode on heating. Mixtures with alkalis, ammonia and most metals are shock-sensitive. Decomposes on heating. This produces toxic gases including nitrogen oxides. See Notes.

Formula: $C_6H_4N_2O_5$ / $C_6H_3(OH)(NO_2)_2$

Molecular mass: 184.11

Melting point: 112°C

Relative density (water = 1): 1.68

Solubility in water, g/l: 6 (poor)

Relative vapour density (air = 1): 6.36

Octanol/water partition coefficient as log Pow: 1.67 (estimated)

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body through the skin and by ingestion.

Effects of short-term exposure

The substance may be irritating to the eyes and skin.

Inhalation risk

A nuisance-causing concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the metabolism. This may result in cataract, cardiovascular disorders and nervous system impairment.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT**

The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Use all available methods for reducing body temperature.

Because of its explosive properties, the compound is used in the form of a water paste.

UN 0076 applies to the dry compound or wetted with less than 15% water (Hazard class 1, Subsidiary Risks 6.1). UN 1320 applies to compound wetted with no less than 15% water

CAS 25550-58-7 applies to unspecified isomers of dinitrophenol.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 23/24/25-33-50; S: (1/2)-28-37-45-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

2,4-DINITROTOLUENE**ICSC: 0727 (April 2005)**1-Methyl-2,4-dinitrobenzene
2,4-DNT**CAS #: 121-14-2****UN #: 3454****EC Number: 204-450-0**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air. Risk of explosion on contact with many substances.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! See Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II
STORAGE	
Fireproof. Separated from strong bases, food and feedstuffs, oxidants and strong reducing agents. Well closed. Keep in a well-ventilated room. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

2,4-DINITROTOLUENE**ICSC: 0727****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

YELLOW CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

May explode on heating. Decomposes on heating. This produces toxic and corrosive fumes including nitrogen oxides even in the absence of air. Reacts with reducing agents, strong bases and oxidants. This generates explosion hazard.

Formula: $C_7H_6N_2O_4$ / $C_6H_3CH_3(NO_2)_2$

Molecular mass: 182.1

Decomposes at >250°C

Melting point: 71°C

Density: 1.52 g/cm³

Solubility in water: very poor

Vapour pressure, Pa at 25°C: 0.02

Relative vapour density (air = 1): 6.28

Flash point: 169°C c.c.

Octanol/water partition coefficient as log Pow: 1.98

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance may cause effects on the blood. This may result in the formation of methaemoglobin. The effects may be delayed. Medical observation is indicated.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure

The substance may have effects on the blood. This may result in the formation of methaemoglobin. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT**

The substance is harmful to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested. Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. Do NOT take working clothes home. UN number for molten form: UN1600, TEC (R) 61GT1-II.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 45-23/24/25-48/22-62-68-51/53; S: 53-45-61; Note: E

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

2,6-DINITROTOLUENE**ICSC: 0728 (April 2005)**1-Methyl-2,6-dinitrobenzene
2,6-DNT**CAS #: 606-20-2****UN #: 3454****EC Number: 210-106-0**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air. Risk of explosion on contact with many substances.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! See Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II
STORAGE	
Fireproof. Separated from strong bases, food and feedstuffs, oxidants and strong reducing agents. Well closed. Keep in a well-ventilated room.	
PACKAGING	
Do not transport with food and feedstuffs.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

2,6-DINITROTOLUENE**ICSC: 0728****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

YELLOW OR BROWN-TO-RED CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

May explode on heating. Decomposes on heating. This produces toxic and corrosive fumes including nitrogen oxides even in the absence of air. Reacts with reducing agents, strong bases and oxidants. This generates explosion hazard.

Formula: $C_7H_6N_2O_4$ / $C_6H_3CH_3(NO_2)_2$

Molecular mass: 182.1

Decomposes at 285°C

Melting point: 66°C

Relative density (water = 1): 1.283 (liquid)

Solubility in water: very poor

Vapour pressure, Pa at 20°C: 2.4

Relative vapour density (air = 1): 6.28

Flash point: 207°C c.c.

Octanol/water partition coefficient as log Pow: 2.05

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance may cause effects on the blood. This may result in the formation of methaemoglobin. The effects may be delayed. Medical observation is indicated.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure

The substance may have effects on the blood. This may result in the formation of methaemoglobin. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT****NOTES**

Depending on the degree of exposure, periodic medical examination is suggested. Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. Do NOT take working clothes home. UN number for molten form: UN1600. See ICSC 0465.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T; R: 45-23/24/25-48/22-62-68-52/53; S: 53-45-61; Note: E

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

2-Chloronaphthalene
 beta-Chloronaphthalene
 bete-Naphthyl chloride

ICSC: 1708 (March 2009)

CAS #: 91-58-7

UN #: 3077

EC Number: 202-079-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use foam, dry powder, carbon dioxide.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Seek medical attention if you feel unwell.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Sore throat. Nausea.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Seek medical attention if you feel unwell.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria WARNING May be harmful if swallowed Toxic to aquatic life Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III
STORAGE	
Provision to contain effluent from fire extinguishing. Separated from strong oxidants. Store in an area without drain or sewer access.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021



European
Commission

2-Chloronaphthalene**ICSC: 1708****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

WHITE CRYSTALLINE POWDER.

Physical dangers**Chemical dangers**

Decomposes on heating. This produces toxic and corrosive gases including hydrogen chloride. Reacts with strong oxidants.

Formula: C₁₀H₇Cl

Molecular mass: 162.6

Boiling point at 101kPa: 259°C

Melting point: 59.5°C

Density: 1.18 g/cm³

Solubility in water, g/100ml: (none)

Vapour pressure, Pa at 25°C: 1

Relative vapour density (air = 1): 5.6

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 125°C

Octanol/water partition coefficient as log Pow: 4.2

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure

The substance may have effects on the liver. This may result in impaired functions.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES**ADDITIONAL INFORMATION****EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

o-CHLOROPHENOL**ICSC: 0849 (March 1999)**

2-Chlorophenol
2-Chloro-1-hydroxybenzene
2-Hydroxychlorobenzene

CAS #: 95-57-8**UN #: 2021****EC Number: 202-433-2**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 64°C explosive vapour/air mixtures may be formed.	NO open flames. Above 64°C use a closed system and ventilation.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Shortness of breath. Sore throat. See Ingestion. Symptoms may be delayed. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain. Blurred vision.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Drowsiness. Weakness. Convulsions.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit and filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered containers as far as possible. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Separated from strong oxidants and food and feedstuffs. Well closed.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

o-CHLOROPHENOL**ICSC: 0849****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air.

Chemical dangers

Decomposes on burning. This produces toxic and corrosive fumes of hydrochloric acid and chlorine. Reacts with oxidants.

Formula: C₆H₅ClO / C₆H₄ClOH

Molecular mass: 128.6

Boiling point: 175°C

Melting point: 9.3-9.8°C

Relative density (water = 1): 1.3

Solubility in water, g/100ml at 20°C: 2.85

Vapour pressure, Pa at 20°C: 230

Relative vapour density (air = 1): 4.4

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.08

Flash point: 64°C c.c.

Octanol/water partition coefficient as log Pow: 2.15

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure

The substance is severely irritating to the eyes, skin and respiratory tract. Inhalation of the aerosol may cause lung oedema. See Notes. The substance may cause effects on the central nervous system.

Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS****ENVIRONMENT**

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort.

Rest and medical observation are therefore essential.

Immediate administration of an appropriate spray, by a doctor or a person authorized by him/her, should be considered.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn, N; R: 20/21/22-51/53; S: (2)-28-61; Note: C

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

2-METHYLNAPHTHALENE

ICSC: 1276 (September 1997)

beta-Methylnaphthalene

CAS #: 91-57-6

EC Number: 202-078-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use powder, foam, carbon dioxide.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use local exhaust.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Rest. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Marine pollutant.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



2-METHYLNAPHTHALENE**ICSC: 1276****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

CRYSTALS.

Physical dangers**Chemical dangers**

Decomposes on heating. This produces acrid smoke and irritating fumes.

Formula: C₁₁H₁₀

Molecular mass: 142.2

Boiling point: 241°C

Melting point: 35°C

Relative density (water = 1): 1.00

Solubility in water, g/100ml at 25°C: 0.003

Vapour pressure, Pa at °C: 9

Octanol/water partition coefficient as log Pow: 3.86

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes.

Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged inhalation may cause effects on the lungs.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.5 ppm as TWA; (skin); A4 (not classifiable as a human carcinogen)

ENVIRONMENT

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

o-CRESOL**ICSC: 0030 (November 2008)**


2-Hydroxy-1-methylbenzene
2-Methylphenol
ortho-Hydroxytoluene
2-Cresol

CAS #: 95-48-7**UN #: 3455****EC Number: 202-423-8**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 81°C explosive vapour/air mixtures may be formed.	NO open flames. Above 81°C use a closed system and ventilation.	Use water spray, foam, powder, carbon dioxide.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation. Headache. Nausea. Vomiting. Shortness of breath. Laboured breathing.	Use local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain. Blisters. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer immediately for medical attention.
Eyes	Redness. Pain. Severe deep burns.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Burns in mouth and throat. Burning sensation in the throat and chest. Nausea. Vomiting. Abdominal pain. Shock or collapse.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit and filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p>  <p>DANGER</p> <p>Toxic if swallowed or in contact with skin Causes severe skin burns and eye damage Causes damage to central nervous system and blood Causes damage to the nervous system and the blood through prolonged or repeated exposure Toxic to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Subsidiary Risks: 8; UN Pack Group: II</p>
STORAGE	
Separated from strong oxidants and food and feedstuffs. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



o-CRESOL

ICSC: 0030

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS CRYSTALS WITH CHARACTERISTIC ODOUR. TURNS DARK ON EXPOSURE TO AIR AND LIGHT.

Physical dangers

No data.

Chemical dangers

Reacts violently with strong oxidants. The solution in water is a weak acid.

Formula: C_7H_8O / $CH_3C_6H_4OH$

Molecular mass: 108.1

Boiling point: 191°C

Melting point: 31°C

Density: 1.05 g/cm³

Solubility in water, g/100ml at 25°C: 2.5 (moderate)

Vapour pressure, Pa at 25°C: 33

Relative vapour density (air = 1): 3.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 81°C c.c.

Auto-ignition temperature: 555°C

Explosive limits, vol% in air: 1.3-?

Octanol/water partition coefficient as log Pow: 1.95

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation, through the skin and by ingestion. Serious local effects by all routes of exposure.

Effects of short-term exposure

The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation may cause lung oedema, but only after initial corrosive effects on eyes and/or airways have become manifest. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. The substance may cause effects on the blood. This may result in destruction of blood cells. Exposure far above the OEL could cause death. Medical observation is indicated.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the nervous system. This may result in impaired functions. The substance may have effects on the blood. This may result in anaemia.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 mg/m³, as TWA; (skin); A4 (not classifiable as a human carcinogen).

EU-OEL: 22 mg/m³, 5 ppm as TWA.

MAK: 4,5 mg/m³, 1 ppm; skin absorption (H); pregnancy risk group: C; peak limitation category: I(1)

ENVIRONMENT

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

ADDITIONAL INFORMATION

EC Classification

Symbol: T, C; R: 24/25-34; S: (1/2)-36/37/39-45; Note: C

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

2-NITROANILINE**ICSC: 0306 (December 2001)**

o-Nitroaniline
1-Amino-2-nitrobenzene
C.I. 37025

CAS #: 88-74-4**UN #: 1661****EC Number: 201-855-4**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Many reactions may cause fire or explosion. Finely dispersed particles form explosive mixtures in air.	NO open flames. NO contact with combustible substances. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Laboured breathing. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes		Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II
STORAGE	
Separated from strong acids, strong oxidants, combustible substances, reducing agents and food and feedstuffs.	
PACKAGING	
Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

2-NITROANILINE**ICSC: 0306****PHYSICAL & CHEMICAL INFORMATION**

Physical State; Appearance
ORANGE-YELLOW CRYSTALS.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

On combustion, forms toxic fumes of nitrogen oxides. Reacts with strong acids, strong oxidants and strong reducing agents. Reacts with organic materials in the presence of moisture. This generates fire hazard.

Formula: $C_6H_6N_2O_2$

Molecular mass: 138.1

Boiling point: 284°C

Melting point: 71°C

Density: 1.44 g/cm³

Solubility in water, g/100ml at 25°C: 0.126

Vapour pressure, Pa at 20°C: 4

Flash point: 168°C

Auto-ignition temperature: 521°C

Octanol/water partition coefficient as log Pow: 1.44

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure

The substance may cause effects on the blood. This may result in the formation of methaemoglobin. The effects may be delayed. Medical observation is indicated. See Notes.

Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

The substance may have effects on the blood. This may result in the formation of methaemoglobin. See Notes.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT**

The substance is harmful to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested. Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. See ICSCs 0307 and 0308.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T; R: 23/24/25-33-52/53; S: (1/2)-28-36/37-45-61; Note: C

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

2-NITROPHENOL**ICSC: 0523 (October 2005)**

o-Nitrophenol
2-Hydroxynitrobenzene
o-Hydroxynitrobenzene

CAS #: 88-75-5**UN #: 1663****EC Number: 201-857-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use dry powder, carbon dioxide, water spray, alcohol-resistant foam.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Headache. Drowsiness. Nausea. Blue lips, fingernails and skin. Confusion. Convulsions. Dizziness. Unconsciousness.	Do not eat, drink, or smoke during work.	Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Store in an area without drain or sewer access. Separated from strong oxidants, strong bases, strong acids and food and feedstuffs.	
PACKAGING	
Do not transport with food and feedstuffs.	



International
Labour
Organization

World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

2-NITROPHENOL**ICSC: 0523****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

YELLOW CRYSTALS.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces toxic and corrosive fumes including nitrogen oxides. Reacts with strong acids, strong bases and strong oxidants.

Formula: C₆H₅NO₃

Molecular mass: 139.1

Boiling point: 216°C

Melting point: 45-46°C

Density: 1.49 g/cm³

Solubility in water, g/100ml at 20°C: 0.21 (poor)

Vapour pressure, kPa at 25°C: 0.015

Flash point: 108°C c.c.

Auto-ignition temperature: 550°C

Octanol/water partition coefficient as log Pow: 1.79

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by ingestion.

Effects of short-term exposure

The substance is mildly irritating to the eyes and skin. Ingestion could cause effects on the blood. This may result in the formation of methaemoglobin.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS****ENVIRONMENT**

The substance is harmful to aquatic organisms.

NOTES

Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.

ADDITIONAL INFORMATION**EC Classification**


All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

3,3'-DICHLOROBENZIDINE**ICSC: 0481 (May 2010)**3,3'-Dichlorobiphenyl-4,4'-ylenediamine
4,4'-Diamino-3,3'-dichlorobiphenyl**CAS #: 91-94-1****EC Number: 202-109-0**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use fine water spray, dry powder, carbon dioxide.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. PREVENT DISPERSION OF DUST! STRICT HYGIENE!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Avoid inhalation of dust. Use local exhaust or breathing protection.	Fresh air, rest. Seek medical attention if you feel unwell.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Seek medical attention if you feel unwell.
Eyes		Wear face shield or eye protection in combination with breathing protection if powder.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p>  <p>DANGER</p> <p>Suspected of causing genetic defects May cause cancer May cause respiratory irritation May cause damage to liver through prolonged or repeated exposure if swallowed Toxic to aquatic life with long lasting effects</p> <p>Transportation UN Classification</p>
STORAGE	
Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Well closed. Store only in original container. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

3,3'-DICHLOROBENZIDINE**ICSC: 0481****PHYSICAL & CHEMICAL INFORMATION**

Physical State; Appearance
GREY-TO-PURPLE CRYSTALS.

Physical dangers
No data.

Chemical dangers
Decomposes on burning. This produces toxic and corrosive fumes including nitrogen oxides and hydrogen chloride.

Formula: $C_6H_3Cl_2NH_2C_6H_3Cl_2NH_2/C_{12}H_{10}Cl_2N_2$
Molecular mass: 253.1
Boiling point: 368°C
Melting point: 132-133°C
Solubility in water: none
Auto-ignition temperature: 350°C
Octanol/water partition coefficient as log Pow: 3.51

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the respiratory tract.

Inhalation risk

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver. This substance is probably carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: skin absorption (H); carcinogen category: 2

ENVIRONMENT

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

The substance is combustible but no flash point is available in literature.
TLV Note: Exposure by all routes should be carefully controlled to levels as low as possible.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 45-21-43-50/53; S: 53-45-60-61; Note: E

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

m-CRESOL**ICSC: 0646 (November 2008)**


3-Cresol
3-Methylphenol
3-Hydroxytoluene
1-Hydroxy-3-methylbenzene

CAS #: 108-39-4**UN #: 2076****EC Number: 203-577-9**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 86°C explosive vapour/air mixtures may be formed.	NO open flames. Above 86°C use a closed system and ventilation.	Use water spray, foam, powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation. Headache. Nausea. Vomiting. Shortness of breath. Laboured breathing.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain. Blisters. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer immediately for medical attention.
Eyes	Redness. Pain. Severe deep burns.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Burns in mouth and throat. Burning sensation in the throat and chest. Nausea. Vomiting. Abdominal pain. Shock or collapse.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit and filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	<p>According to UN GHS Criteria</p>  <p>ANGER</p> <p>Toxic if swallowed Harmful in contact with skin Fatal if inhaled Causes severe skin burns and eye damage Causes damage to central nervous system and blood if blood Causes damage to the nervous system and the blood through prolonged or repeated exposure if the blood Toxic to aquatic life</p>
STORAGE	
Separated from strong oxidants and food and feedstuffs. Ventilation along the floor. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Do not transport with food and feedstuffs.	<p>Transportation UN Classification UN Hazard Class: 6.1; UN Subsidiary Risks: 8; UN Pack Group: II</p>



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

m-CRESOL

ICSC: 0646

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-YELLOW LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Reacts violently with strong oxidants. The solution in water is a weak acid.

Formula: C₇H₈O / CH₃C₆H₄OH

Molecular mass: 108.1

Boiling point: 202°C

Melting point: 11-12°C

Relative density (water = 1): 1.03

Solubility in water, g/100ml at 20°C: 2.4 (moderate)

Vapour pressure, Pa at 20°C: 13

Relative vapour density (air = 1): 3.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0

Flash point: 86°C

Auto-ignition temperature: 575°C

Explosive limits, vol% in air: 1.0-?

Octanol/water partition coefficient as log Pow: 1.96

Viscosity: 4.05 mm²/s at 50°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion. Serious local effects by all routes of exposure.

Effects of short-term exposure

The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation may cause lung oedema, but only after initial corrosive effects on eyes and/or airways have become manifest. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. The substance may cause effects on the blood. This may result in destruction of blood cells. Exposure far above the OEL could cause death. Medical observation is indicated.

Inhalation risk

A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the nervous system. This may result in impaired functions. The substance may have effects on the blood. This may result in anaemia.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 mg/m³, as TWA; (skin); A4 (not classifiable as a human carcinogen).EU-OEL: 22 mg/m³, 5 ppm as TWA.MAK: 4,5 mg/m³, 1 ppm; skin absorption (H); peak limitation category: I(1); pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

ADDITIONAL INFORMATION

EC Classification

Symbol: T, C; R: 24/25-34; S: (1/2)-36/37/39-45; Note: C

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

3-NITROANILINE**ICSC: 0307 (December 2001)**

m-Nitroaniline
1-Amino-3-nitrobenzene
C.I. 37030

CAS #: 99-09-2**UN #: 1661****EC Number: 202-729-1**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Many reactions may cause fire or explosion. Finely dispersed particles form explosive mixtures in air.	NO open flames. NO contact with combustible substances. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Laboured breathing. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes		Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II
STORAGE	
Separated from strong acids, strong oxidants, combustible substances, reducing agents and food and feedstuffs. Dry.	
PACKAGING	
Do not transport with food and feedstuffs.	



International
Labour
Organization

World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

3-NITROANILINE**ICSC: 0307****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

YELLOW CRYSTALS.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

On combustion, forms toxic fumes of nitrogen oxides. Reacts with strong acids, strong oxidants and strong reducing agents. Reacts with organic materials in the presence of moisture. This generates fire hazard.

Formula: C₆H₅N₂O₂

Molecular mass: 138.1

Decomposes at 306°C

Melting point: 114°C

Density: 1.4 g/cm³

Solubility in water, g/100ml at 25°C: 0.089

Vapour pressure, Pa at 25°C: 0.005

Octanol/water partition coefficient as log Pow: 1.37

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure

The substance may cause effects on the blood. This may result in the formation of methaemoglobin. Medical observation is indicated. The effects may be delayed. See Notes.

Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

The substance may have effects on the blood. This may result in the formation of methaemoglobin. See Notes.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT**

The substance is harmful to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested. Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. See ICSCs 0306 and 0308.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T; R: 23/24/25-33-52/53; S: (1/2)-28-36/37-45-61; Note: C

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

DINITRO-o-CRESOL**ICSC: 0462 (April 2004)**

4,6-Dinitro-ortho-cresol
 2-Methyl-4,6-dinitrophenol
 DNOC
 2,4-Dinitro-ortho-cresol

CAS #: 534-52-1**UN #: 1598****EC Number: 208-601-1**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air. Risk of fire and explosion on contact with oxidizing agents.	NO open flames. NO contact with oxidizing agents. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, foam, dry powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sweating. Fever. Nausea. Shortness of breath. Laboured breathing. Headache. Convulsions. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Yellow staining of the skin. Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II
STORAGE	
Separated from strong oxidants and food and feedstuffs. Well closed.	
PACKAGING	
Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021



European
Commission

DINITRO-o-CRESOL**ICSC: 0462****PHYSICAL & CHEMICAL INFORMATION**

Physical State; Appearance
ODOURLESS YELLOW CRYSTALS.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

Decomposes on burning. This produces toxic fumes including nitrogen oxides. Reacts violently with strong oxidants.

Formula: $C_7H_6N_2O_5$ / $CH_3C_6H_2OH(NO_2)_2$

Molecular mass: 198.1

Boiling point: 312°C

Melting point: 87.5°C

Density: 1.58 g/cm³

Solubility in water, g/100ml at 20°C: 0.694

Vapour pressure, Pa at 25°C: 0.016

Relative vapour density (air = 1): 6.8

Auto-ignition temperature: 340°C

Octanol/water partition coefficient as log Pow: 2.56

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is corrosive to the eyes. The substance is irritating to the skin. The substance may cause effects on the metabolic rate. Exposure at high levels could cause death.

Inhalation risk

A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS**

TLV: (inhalable fraction and vapour): 0.2 mg/m³, as TWA; (skin).

MAK: (vapour and aerosol): skin absorption (H)

ENVIRONMENT

The substance is very toxic to aquatic organisms.

NOTES

Do NOT take working clothes home.

Technical grade may cause skin sensitization.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T+, N; R: 26/27/28-38-41-43-44-50/53-68; S: (1/2)-36/37-45-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.



TCI AMERICA

SAFETY DATA SHEET

Page 1 of 5

Revision number: 2
Revision date: 10/06/2014

1. IDENTIFICATION

Product name: 4-Bromodiphenyl Ether
Product code: B0637

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborside Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

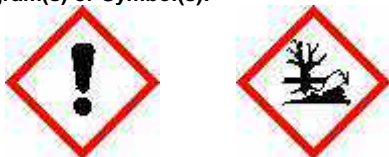
2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Skin Corrosion/Irritation [Category 2]
Eye Damage/Irritation [Category 2A]
Aquatic Hazard (Acute) [Category 1]
Aquatic Hazard (Long-Term) [Category 1]

Signal word: Warning!

Hazard Statement(s): Causes serious eye irritation
Causes skin irritation
Very toxic to aquatic life
Very toxic to aquatic life with long lasting effects

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

[Prevention]
[Response]

Wash hands and face thoroughly after handling. Wear protective gloves. Wear eye and face protection.
If on skin: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention.

[Storage]
[Disposal]

None
None

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance
Components: 4-Bromodiphenyl Ether
Percent: >98.0%(GC)

3. COMPOSITION/INFORMATION ON INGREDIENTS

CAS Number:	101-55-3
Molecular Weight:	249.11
Chemical Formula:	C ₁₂ H ₉ BrO
Synonyms:	4-Bromophenyl Phenyl Ether

4. FIRST-AID MEASURES

Inhalation:	Call emergency medical service. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Skin contact:	Call a poison center or doctor if you feel unwell. Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Eye contact:	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Ingestion:	Do not induce vomiting without medical advice. If swallowed, seek medical advice immediately and show the container or label. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Symptoms/effects:	
Acute:	Redness.
Delayed:	No data available
Immediate medical attention:	If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media:	Dry chemical, CO ₂ , sand, earth, water spray or regular foam Consult with local fire authorities before attempting large scale fire fighting operations.
-------------------------------	--

Specific hazards arising from the chemical

Hazardous combustion products:	These products include: Carbon oxides Halogenated compounds
Other specific hazards:	Closed containers may explode from heat of a fire.

Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
Personal protective equipment:	Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).
Emergency procedures:	In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and exercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

6. ACCIDENTAL RELEASE MEASURES**Methods and materials for containment and cleaning up:**

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material. Ventilate the area.

Environmental precautions:

Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

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

Do NOT breath gas, fumes, vapor, or spray. Avoid contact with skin and eyes. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage:

Keep only in the original container in a cool well-ventilated place. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities:

Combustible substances, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION**Exposure limits:**

No data available

Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment**Respiratory protection:**

Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection:

Wear protective gloves.

Eye protection:

Splash goggles.

Skin and body protection:

Lab coat.

9. PHYSICAL AND CHEMICAL PROPERTIES**Physical state (20°C):**

Liquid

Form:

Clear

Color:

Colorless - Very pale yellow

Odor:

No data available

Odor threshold:

No data available

Melting point/freezing point:

18°C (Freezing point) (64°F)

Boiling point/range:

305°C (581°F)

Decomposition temperature:

No data available

Relative density:

1.43

Kinematic Viscosity:

No data available

Partition coefficient:

No data available

n-octanol/water (log P_{ow})**pH:**

No data available

Vapor pressure:

No data available

Vapor density:

No data available

Dynamic Viscosity:

No data available

Evaporation rate:

No data available

(Butyl Acetate = 1)

Flash point:

110°C (230°F)

Flammability (solid, gas):

No data available

Autoignition temperature:

No data available

Flammability or explosive limits:

Lower: No data available

Upper: No data available

Solubility(ies):**10. STABILITY AND REACTIVITY****Reactivity:**

Not Available.

Chemical Stability:

Stable under recommended storage conditions. (See Section 7)

Possibility of Hazardous Reactions:

No hazardous reactivity has been reported.

Conditions to avoid:

Avoid excessive heat and light.

Incompatible materials:

Strong oxidizing agents

Hazardous Decomposition Products:

No data available

11. TOXICOLOGICAL INFORMATION**Acute Toxicity:**

No data available

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available**NTP:** No data available**OSHA:** No data available**Reproductive toxicity:**

No data available

Routes of Exposure:

Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Skin contact may result in redness, pain or dry skin. Eye contact may result in redness or pain.

Potential Health Effects:

Skin and eye contact may result in irritation.

Target organ(s):

No data available

12. ECOLOGICAL INFORMATION**Ecotoxicity****Fish:**

No data available

Crustacea:

No data available

Algae:

No data available

Persistence and degradability:

No data available

Bioaccumulative potential (BCF):

No data available

Mobility in soil:

No data available

Partition coefficient:

No data available

n-octanol/water (log P_{ow})**Soil adsorption (Koc):**

No data available

Henry's Law:

No data available

constant (PaM³/mol)**13. DISPOSAL CONSIDERATIONS****Disposal of product:**

Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.

Disposal of container:

Dispose of as unused product. Do not re-use empty containers.

Other considerations:

Observe all federal, state and local regulations when disposing of the substance.

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

Non-hazardous for transportation.

14. TRANSPORT INFORMATION**IATA** Non-hazardous for transportation.**IMDG** Non-hazardous for transportation.**15. REGULATORY INFORMATION****Toxic Substance Control Act (TSCA 8b.):**

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations**CERCLA Hazardous substance and Reportable Quantity:****SARA 313:** Not Listed
SARA 302: Not Listed**State Regulations****State Right-to-Know****Massachusetts** Not Listed
New Jersey Listed
Pennsylvania Not Listed
California Proposition 65: Not Listed**Other Information****NFPA Rating:****Health:** 2
Flammability: 1
Instability: 0**HMIS Classification:****Health:** 2
Flammability: 1
Physical: 0**International Inventories****WHMIS hazard class:** D2B: Materials causing other toxic effects. (Toxic)
EC-No: 202-952-4**16. OTHER INFORMATION****Revision date:** 10/06/2014**Revision number:** 2

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

4-CHLORO-m-CRESOL

ICSC: 0131 (June 1997)

p-Chloro-m-cresol
2-Chloro-5-hydroxytoluene
4-Chloro-3-methylphenol

CAS #: 59-50-7

UN #: 2669

EC Number: 200-431-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. See Ingestion.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain. Severe deep burns.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Headache. Dizziness. Shortness of breath. Abdominal pain. Vomiting. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II
STORAGE	
Separated from food and feedstuffs. Dry.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

4-CHLORO-m-CRESOL**ICSC: 0131****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

WHITE OR SLIGHTLY PINK HYGROSCOPIC CRYSTALS OR CRYSTALLINE POWDER.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride and phosgene.

Formula: C_7H_7ClO / $C_6H_3OHCH_3Cl$

Molecular mass: 142.58

Boiling point: 235°C

Melting point: 66°C

Density: 1.4 g/cm³

Solubility in water, g/100ml at 20°C: 0.38

Flash point: 118°C

Auto-ignition temperature: 590°C

Octanol/water partition coefficient as log Pow: 3.1

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract.

Inhalation risk

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization.

OCCUPATIONAL EXPOSURE LIMITS

MAK sensitization of skin (SH)

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES**ADDITIONAL INFORMATION****EC Classification**

Symbol: Xn, N; R: 21/22-41-43-50; S: (2)-26-36/37/39-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

4-CHLOROANILINE**ICSC: 0026 (October 2001)**Chloroaminobenzene, p-
Chloroaniline, p-**CAS #: 106-47-8****UN #: 2018****EC Number: 203-401-0**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, foam, carbon dioxide.

PREVENT DISPERSION OF DUST! STRICT HYGIENE! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Confusion. Convulsions. Dizziness. Headache. Nausea. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: P3 filter respirator for toxic particles and chemical protection suit. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II
STORAGE	
Separated from strong oxidants and food and feedstuffs.	
PACKAGING	
Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

4-CHLOROANILINE**ICSC: 0026****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS-TO-YELLOW CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride and nitrogen oxides. Reacts violently with oxidants.

Formula: C₆H₆ClN / ClC₆H₄NH₂

Molecular mass: 127.6

Boiling point: 232°C

Melting point: 69-72.5°C

Relative density (water = 1): 1.4

Solubility in water, g/100ml at 20°C: 0.39

Vapour pressure, Pa at 20°C: 2

Relative vapour density (air = 1): 4.4

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 120-123°C o.c.

Auto-ignition temperature: 685°C

Octanol/water partition coefficient as log Pow: 1.8

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes. The substance may cause effects on the red blood cells. This may result in lesions of blood cells and the formation of methaemoglobin. Medical observation is indicated. The effects may be delayed.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. The substance may have effects on the spleen. Tumours have been detected in experimental animals but may not be relevant to humans. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

MAK: skin absorption (H); sensitization of skin (SH); carcinogen category: 2

ENVIRONMENT

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested. Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 45-23/24/25-43-50/53; S: 53-45-60-61; Note: E

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

4-Chlorodiphenyl ether

Safety Data Sheet 26075X4

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 11/27/2017

Version: 1.0

SECTION 1: Identification

1.1. Identification

Product form	: Substance
Substance name	: 4-Chlorodiphenyl ether
CAS No	: 7005-72-3
Product code	: 2607-5-X4
Formula	: C ₁₂ H ₉ ClO
Synonyms	: 1-Chloro-4-phenoxybenzene
Other means of identification	: MFCD00055431

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	: Laboratory chemicals Manufacture of substances Scientific research and development
------------------------------	--

1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.
P.O. Box 309
Alachua, FL 32615 - United States of America
T (386) 462-0788 - F (386) 462-7097
info@synquestlabs.com - www.synquestlabs.com

1.4. Emergency telephone number

Emergency number	: (844) 523-4086 (3E Company - Account 10069)
------------------	---

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Skin Irrit. 2	H315 - Causes skin irritation
Eye Irrit. 2A	H319 - Causes serious eye irritation
STOT SE 3	H335 - May cause respiratory irritation

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US)



GHS07

Signal word (GHS-US)

: Warning

Hazard statements (GHS-US)

: H315 - Causes skin irritation
H319 - Causes serious eye irritation
H335 - May cause respiratory irritation

Precautionary statements (GHS-US)

: P261 - Avoid breathing fumes, mist, spray, vapors
P264 - Wash skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302+P352 - If on skin: Wash with plenty of soap and water
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P312 - Call a POISON CENTER or doctor/physician if you feel unwell
P321 - Specific treatment (see supplemental first aid instructions on this label)
P332+P313 - If skin irritation occurs: Get medical advice/attention
P337+P313 - If eye irritation persists: Get medical advice/attention
P362+P364 - Take off contaminated clothing and wash it before reuse
P403+P233 - 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

4-Chlorodiphenyl ether

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
4-Chlorodiphenyl ether (Main constituent)	(CAS No) 7005-72-3	<= 100	Skin Irrit. 2, H315 Eye Irrit. 2A, H319 STOT SE 3, H335

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

- First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.
- First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Get medical advice/attention.
- First-aid measures after skin contact : Wash with plenty of soap and water. Get medical advice/attention.
- First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/attention.
- First-aid measures after ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth out with water. Get medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed

- Symptoms/injuries : The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

- Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen chloride.
- Explosion hazard : Risk of explosion if heated under confinement. Use water spray or fog for cooling exposed containers.

5.3. Advice for firefighters

- Firefighting instructions : In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion.
- Protection during firefighting : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

- General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe gas, fumes, vapor or spray.

6.1.1. For non-emergency personnel

- Emergency procedures : Only qualified personnel equipped with suitable protective equipment may intervene.

6.1.2. For emergency responders

- Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".
- Emergency procedures : Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level.

4-Chlorodiphenyl ether

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

- For containment : Stop leak if safe to do so. Dike for recovery or absorb with appropriate material.
- Methods for cleaning up : Take up large spills with pump or vacuum and finish with dry chemical absorbent. Use explosion-proof equipment. Take up small spills with dry chemical absorbent. Sweep or shovel spills into appropriate container for disposal. Ventilate area.
- Other information : For disposal of solid materials or residues refer to section 13 : "Disposal considerations".

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Ensure good ventilation of the work station. Do not breathe fumes, mist, spray, vapors. Wear personal protective equipment. Avoid contact with skin and eyes.
- Hygiene measures : Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

- Technical measures : Comply with applicable regulations.
- Storage conditions : Keep container closed when not in use.
- Incompatible materials : Refer to Section 10 on Incompatible Materials.
- Storage area : Store in dry, cool, well-ventilated area.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Exposure controls

- Appropriate engineering controls : Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
- Hand protection : Protective gloves. 29 CFR 1910.138: Hand Protection.
- Eye protection : Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.
- Skin and body protection : Wear suitable protective clothing.
- Respiratory protection : In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory Protection.
- Other information : Safety shoes. 29 CFR 1910.136: Foot Protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- Physical state : Liquid
- Color : No data available
- Odor : No data available
- Odor threshold : No data available
- pH : No data available
- Melting point : -8 °C
- Freezing point : No data available
- Boiling point : 161 - 162 °C (@ 19 mm Hg)
- Flash point : > 110 °C
- Relative evaporation rate (butyl acetate=1) : No data available
- Flammability (solid, gas) : No data available
- Explosion limits : No data available
- Explosive properties : No data available
- Oxidizing properties : No data available
- Vapor pressure : No data available

4-Chlorodiphenyl ether

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Relative density	: No data available
Relative vapor density at 20 °C	: No data available
Specific gravity / density	: 1.193 g/ml (@ 20 °C)
Molecular mass	: 204.652 g/mol
Solubility	: No data available
Log Pow	: No data available
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Viscosity	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available

9.2. Other information

Refractive index	: 1.587 (@ 20 °C)
------------------	-------------------

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

The product is stable at normal handling and storage conditions.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong acids. Strong bases. Strong oxidizing agents.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	: Not classified
Skin corrosion/irritation	: Causes skin irritation.
Serious eye damage/irritation	: Causes serious eye irritation.
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
Specific target organ toxicity (single exposure)	: May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	: Not classified
Aspiration hazard	: Not classified

SECTION 12: Ecological information

12.1. Toxicity

No additional information available

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

No additional information available

4-Chlorodiphenyl ether

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber.
Waste disposal recommendations : Dispose of contents/container in accordance with licensed collector's sorting instructions.
Additional information : Recycle the material as far as possible.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

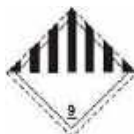
Transport document description : UN3082 Environmentally hazardous substances, liquid, n.o.s., 9, III

UN-No.(DOT) : UN3082

Proper Shipping Name (DOT) : Environmentally hazardous substances, liquid, n.o.s.

Transport hazard class(es) (DOT) : 9 - Class 9 - Miscellaneous hazardous material 49 CFR 173.140

Hazard labels (DOT) : 9 - Class 9 (Miscellaneous dangerous materials)



Packing group (DOT) : III - Minor Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 203

DOT Packaging Bulk (49 CFR 173.xxx) : 241

DOT Symbols : G - Identifies PSN requiring a technical name

DOT Special Provisions (49 CFR 172.102) : 8 - A hazardous substance that is not a hazardous waste may be shipped under the shipping description "Other regulated substances, liquid or solid, n.o.s.", as appropriate. In addition, for solid materials, special provision B54 applies.

146 - This description may be used for a material that poses a hazard to the environment but does not meet the definition for a hazardous waste or a hazardous substance, as defined in 171.8 of this subchapter, or any hazard class as defined in Part 173 of this subchapter, if it is designated as environmentally hazardous by the Competent Authority of the country of origin, transit or destination.

173 - An appropriate generic entry may be used for this material.

335 - Mixtures of solids that are not subject to this subchapter and environmentally hazardous liquids or solids may be classified as "Environmentally hazardous substances, solid, n.o.s.," UN3077 and may be transported under this entry, provided there is no free liquid visible at the time the material is loaded or at the time the packaging or transport unit is closed. Each

transport unit must be leak-proof when used as bulk packaging.

IB3 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1 and 31HA2, 31HB2, 31HN2, 31HD2 and 31HH2). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized, except for UN2672 (also see Special Provision IP8 in Table 2 for UN2672).

T4 - 2.65 178.274(d)(2) Normal..... 178.275(d)(3)

TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = $97 / 1 + a (tr - tf)$ Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling.

TP29 - A portable tank having a minimum test pressure of 1.5 bar (150.0 kPa) may be used provided the calculated test pressure is 1.5 bar or less based on the MAWP of the hazardous materials, as defined in 178.275 of this subchapter, where the test pressure is 1.5 times the MAWP.

DOT Packaging Exceptions (49 CFR 173.xxx) : 155

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : No limit

4-Chlorodiphenyl ether

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	: No limit
DOT Vessel Stowage Location	: A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel.
Other information	: No supplementary information available.

TDG

No additional information available

Transport by sea

UN-No. (IMDG)	: 3082
Proper Shipping Name (IMDG)	: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
Class (IMDG)	: 9 - Miscellaneous dangerous compounds
Packing group (IMDG)	: III - substances presenting low danger

Air transport

UN-No. (IATA)	: 3082
Proper Shipping Name (IATA)	: Environmentally hazardous substance, liquid, n.o.s.
Class (IATA)	: 9 - Miscellaneous Dangerous Goods
Packing group (IATA)	: III - Minor Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory except for:

4-Chlorodiphenyl ether	CAS No 7005-72-3	100%
------------------------	------------------	------

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

No additional information available

EU-Regulations

No additional information available

National regulations

No additional information available

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

SECTION 16: Other information

Full text of H-phrases:

Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

4-Chlorodiphenyl ether

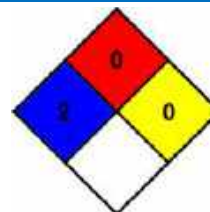
Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

NFPA health hazard : 2 - Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health : 2 Moderate Hazard - Temporary or minor injury may occur

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable for any damage resulting from handling or from contact with the above product.

p-CRESOL**ICSC: 0031 (November 2008)**


4-Hydroxy-1-methylbenzene
4-Methylphenol
para-Hydroxytoluene
4-Cresol

CAS #: 106-44-5**UN #: 3455****EC Number: 203-398-6**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 86°C explosive vapour/air mixtures may be formed.	NO open flames. Above 86°C use a closed system and ventilation.	Use water spray, foam, powder, carbon dioxide.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation. Headache. Nausea. Vomiting. Shortness of breath. Laboured breathing.	Use local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain. Blisters. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer immediately for medical attention.
Eyes	Redness. Pain. Severe burns.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Burns in mouth and throat. Burning sensation in the throat and chest. Nausea. Vomiting. Abdominal pain. Shock or collapse.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance and chemical protection suit. Sweep spilled substance into containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	<p>According to UN GHS Criteria</p>  <p>DANGER</p> <p>Toxic if swallowed or in contact with skin Fatal if inhaled Causes severe skin burns and eye damage Causes damage to central nervous system and blood Causes damage to the nervous system and the blood through prolonged or repeated exposure Toxic to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Subsidiary Risks: 8; UN Pack Group: II</p>
STORAGE	
Separated from strong oxidants and food and feedstuffs. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



p-CRESOL**ICSC: 0031****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS CRYSTALS WITH CHARACTERISTIC ODOUR. TURNS DARK ON EXPOSURE TO AIR AND LIGHT.

Physical dangers**Chemical dangers**

Reacts violently with strong oxidants. The solution in water is a weak acid.

Formula: C_7H_8O / $CH_3C_6H_4OH$

Molecular mass: 108.1

Boiling point: 202°C

Melting point: 35°C

Density: 1.02 g/cm³

Solubility in water, g/100ml at 25°C: 1.9 (moderate)

Vapour pressure, Pa at 25°C: 15

Relative vapour density (air = 1): 1.00

Flash point: 86°C c.c.

Auto-ignition temperature: 555°C

Explosive limits, vol% in air: 1.0-?

Octanol/water partition coefficient as log Pow: 1.94

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion. Serious local effects by all routes of exposure.

Effects of short-term exposure

The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation may cause lung oedema, but only after initial corrosive effects on eyes and/or airways have become manifest. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. The substance may cause effects on the blood. This may result in destruction of blood cells. Exposure far above the OEL could cause death. Medical observation is indicated.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the nervous system. This may result in impaired functions. The substance may have effects on the blood. This may result in anaemia.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 mg/m³, as TWA; (skin); A4 (not classifiable as a human carcinogen).

EU-OEL: 22 mg/m³, 5 ppm as TWA.

MAK: 4,5 mg/m³, 1 ppm; skin absorption (H); peak limitation category: I(1); pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES**ADDITIONAL INFORMATION****EC Classification**

Symbol: T, C; R: 24/25-34; S: (1/2)-36/37/39-45; Note: C

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

4-NITROANILINE**ICSC: 0308 (December 2001)**

p-Nitroaniline
1-Amino-4-nitrobenzene
C.I. 37035

CAS #: 100-01-6**UN #: 1661****EC Number: 202-810-1**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Many reactions may cause fire or explosion. Finely dispersed particles form explosive mixtures in air.	NO open flames. NO contact with combustible substances. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Laboured breathing. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Wash away remainder with plenty of water.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II
STORAGE	
Separated from strong acids, strong oxidants, combustible substances, reducing agents and food and feedstuffs. Dry.	
PACKAGING	
Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

4-NITROANILINE**ICSC: 0308****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

YELLOW CRYSTALS OR POWDER.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

May explode on heating. On combustion, forms toxic fumes of nitrogen oxides. Reacts with strong acids, strong oxidants and strong reducing agents. Reacts with organic materials in the presence of moisture. This generates fire hazard.

Formula: $C_6H_5N_2O_2$

Molecular mass: 138.1

Boiling point: 332°C

Melting point: 148°C

Density: 1.4 g/cm³

Solubility in water, g/100ml at 18.5°C: 0.08

Vapour pressure, Pa at 20°C: 0.2

Relative vapour density (air = 1): 4.8

Flash point: 199°C

Octanol/water partition coefficient as log Pow: 2.66

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure

The substance is mildly irritating to the eyes. The substance may cause effects on the blood. This may result in the formation of methaemoglobin. The effects may be delayed. Medical observation is indicated. See Notes.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C, on spraying or dispersing much faster.

Effects of long-term or repeated exposure

The substance may have effects on the blood. This may result in the formation of methaemoglobin. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 3 mg/m³, as TWA; (skin); A4 (not classifiable as a human carcinogen); BEI issued.

MAK: skin absorption (H); carcinogen category: 3

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested. Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. See ICSCs 0306 and 0307.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T; R: 23/24/25-33-52/53; S: (1/2)-28-36/37-45-61; Note: C

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

p-NITROPHENOL**ICSC: 0066 (November 1998)**4-Nitrophenol
4-Hydroxynitrobenzene**CAS #: 100-02-7****UN #: 1663****EC Number: 202-811-7**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Cough. Burning sensation. Confusion. Convulsions. Dizziness. Headache. Nausea. Sore throat. Unconsciousness. Weakness.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety spectacles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Sore throat. Vomiting. See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Rest. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Separated from combustible substances, reducing agents and food and feedstuffs. Well closed.	
PACKAGING	
Do not transport with food and feedstuffs.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

p-NITROPHENOL**ICSC: 0066****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS-TO-PALE-YELLOW CRYSTALS.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

May explode on heating. Decomposes on heating. This produces toxic fumes including nitrogen oxides. Mixtures with potassium hydroxide are explosive.

Formula: C₆H₅NO₃

Molecular mass: 139.1

Decomposes at 279°C

Melting point: 111-116°C

Density: 1.5 g/cm³

Solubility in water, g/100ml at 20°C: 1.24

Vapour pressure, Pa at 20°C: 0.0032

Flash point: 169°C

Auto-ignition temperature: 490°C

Octanol/water partition coefficient as log Pow: 1.91

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the blood. This may result in the formation of methaemoglobin. The effects may be delayed. Medical observation is indicated.

Inhalation risk

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT**

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested. Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn; R: 20/21/22-33; S: (2)-28


All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

ACENAPHTHENE**ICSC: 1674 (October 2006)**1,2-Dihydroacenaphthylene
1,8-Ethylenenaphthalene**CAS #: 83-32-9****UN #: 3077****EC Number: 201-469-6**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, dry powder, foam, carbon dioxide.

See Notes. PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  WARNING Very toxic to aquatic life with long lasting effects Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III
STORAGE	
Separated from strong oxidants. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	
PACKAGING	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



ACENAPHTHENE**ICSC: 1674****PHYSICAL & CHEMICAL INFORMATION**

Physical State; Appearance
WHITE-TO-BEIGE CRYSTALS.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

On combustion, forms toxic gases including carbon monoxide. Reacts with strong oxidants.

Formula: C₁₂H₁₀
Molecular mass: 154.2
Boiling point: 279°C
Melting point: 95°C
Density: 1.2 g/cm³
Solubility in water, g/100ml at 25°C: 0.0004
Vapour pressure, Pa at 25°C: 0.3
Relative vapour density (air = 1): 5.3
Flash point: 135°C o.c.
Auto-ignition temperature: >450 °C
Octanol/water partition coefficient as log Pow: 3.9/4.5

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Effects of short-term exposure**Inhalation risk**

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

See Notes.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT**

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

Acenaphthene occurs as a pure substance and also as a component of polyaromatic hydrocarbon (PAH) mixtures. Human population studies have associated PAH's exposure with cancer and cardiovascular diseases. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1 Identification

Product identifier

Product name: Acenaphthalene

Stock number: L02159

CAS Number:

208-96-8

EC number:

205-917-1

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Manufacturer/Supplier:

Alfa Aesar

Thermo Fisher Scientific Chemicals, Inc.

30 Bond Street

Ward Hill, MA 01835-8099

Tel: 800-343-0660

Fax: 800-322-4757

Email: tech@alfa.com

www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)



GHS06 Skull and crossbones

Acute Tox. 3 H301 Toxic if swallowed.

Hazards not otherwise classified No information known.

Label elements

GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)

Hazard pictograms



GHS06

Signal word

Danger

Hazard statements

H301 Toxic if swallowed.

Precautionary statements

P264 Wash thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.

P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/...

P321 Specific treatment (see on this label).

P405 Store locked up.

P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

WHMIS classification

D1B - Toxic material causing immediate and serious toxic effects



Classification system

HMIS ratings (scale 0-4)

(Hazardous Materials Identification System)

HEALTH 1 Health (acute effects) = 1

FIRE 1 Flammability = 1

REACTIVITY 1 Physical Hazard = 1

Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances

CAS# Description:

208-96-8 Acenaphthalene

Identification number(s):

EC number: 205-917-1

4 First-aid measures

Description of first aid measures

After inhalation

Supply fresh air. If required, provide artificial respiration. Keep patient warm.

Seek immediate medical advice.

After skin contact

Immediately wash with water and soap and rinse thoroughly.

Seek immediate medical advice.

After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing Seek medical treatment.

Product name: Acenaphthalene

(Contd. of page 1)

Information for doctor

Most important symptoms and effects, both acute and delayed No further relevant information available.

Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

Special hazards arising from the substance or mixture

If this product is involved in a fire, the following can be released:

Carbon monoxide and carbon dioxide

Advice for firefighters

Protective equipment:

Wear self-contained respirator.

Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Wear protective equipment. Keep unprotected persons away.

Ensure adequate ventilation

Environmental precautions: Do not allow material to be released to the environment without proper governmental permits.

Methods and material for containment and cleaning up: Dispose of contaminated material as waste according to section 13.

Prevention of secondary hazards: No special measures required.

Reference to other sections

See Section 7 for information on safe handling

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

7 Handling and storage

Handling

Precautions for safe handling

Keep container tightly sealed.

Store in cool, dry place in tightly closed containers.

Ensure good ventilation at the workplace.

Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities

Storage

Requirements to be met by storerooms and receptacles: No special requirements.

Information about storage in one common storage facility: Store away from oxidizing agents.

Further information about storage conditions:

Keep container tightly sealed.

Store in cool, dry conditions in well sealed containers.

Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:

Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace: Not required.

Additional information: No data

Exposure controls

Personal protective equipment

General protective and hygienic measures

The usual precautionary measures for handling chemicals should be followed.

Keep away from foodstuffs, beverages and feed.

Remove all soiled and contaminated clothing immediately.

Wash hands before breaks and at the end of work.

Maintain an ergonomically appropriate working environment.

Breathing equipment: Use suitable respirator when high concentrations are present.

Protection of hands:

Impervious gloves

Check protective gloves prior to each use for their proper condition.

The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Eye protection: Safety glasses

Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance:

Form: Powder

Color: Light brown

Odor: Not determined

Odor threshold: Not determined.

pH-value: Not applicable.

Change in condition

Melting point/Melting range: 89-92 °C (192-198 °F)

Boiling point/Boiling range: 265-275 °C (509-527 °F)

Sublimation temperature / start: Not determined

Flash point: 122 °C (252 °F)

Flammability (solid, gaseous) Not determined.

Ignition temperature: Not determined

Decomposition temperature: Not determined

Auto igniting: Not determined.

Danger of explosion: Product does not present an explosion hazard.

(Contd. on page 3)

USA

Product name: Acenaphthalene

(Contd. of page 2)

Explosion limits:
Lower: Not determined
Upper: Not determined
Vapor pressure: Not applicable.
Density at 20 °C (68 °F): 0.899 g/cm³ (7.502 lbs/gal)
Relative density: Not determined.
Vapor density: Not applicable.
Evaporation rate: Not applicable.
Solubility in / Miscibility with
Water: Insoluble
Partition coefficient (n-octanol/water): Not determined.
Viscosity:
dynamic: Not applicable.
kinematic: Not applicable.
Other information: No further relevant information available.

10 Stability and reactivity

Reactivity: No information known.
Chemical stability: Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions: No dangerous reactions known
Conditions to avoid: No further relevant information available.
Incompatible materials: Oxidizing agents
Hazardous decomposition products: Carbon monoxide and carbon dioxide

11 Toxicological information

Information on toxicological effects
Acute toxicity: Harmful if swallowed.
LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: May cause irritation
Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: No effects known.
Carcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity: No effects known.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Other information (about experimental toxicology):
 Mutagenic effects have been observed on tests with human lymphocytes.
 Bacterial mutagenicity test: Ames Salmonella Typhimurium: Negative
Subacute to chronic toxicity:
 The Registry of Toxic Effects of Chemical Substances (RTECS) reports the following effects in laboratory animals:
 Autonomic Nervous System - other (direct) parasympathomimetic.
 Lungs, Thorax, or Respiration - respiratory depression
 Blood - hemorrhage.
 Lungs, Thorax, or Respiration - structural or functional change in trachea or bronchi.
 Lungs, Thorax, or Respiration - bronchiolar dilation
 Nutritional and Gross Metabolic - weight loss or decreased weight gain.
 Immunological Including Allergic - uncharacterized.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability: No further relevant information available.
Bioaccumulative potential: No further relevant information available.
Mobility in soil: No further relevant information available.
Additional ecological information:
General notes:
 Do not allow material to be released to the environment without proper governmental permits.
 Do not allow undiluted product or large quantities to reach ground water, water course or sewage system.
 Avoid transfer into the environment.
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects: No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation: Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

Not a hazardous material for transportation.

UN-Number DOT, IMDG, IATA	None
UN proper shipping name DOT, IMDG, IATA	None
Transport hazard class(es) DOT, ADR, IMDG, IATA Class	None

(Contd. on page 4)
USA

Product name: **Acenaphthalene**

(Contd. of page 3)

Packing group
DOT, IMDG, IATA

None

Environmental hazards:

Not applicable.

Special precautions for user

Not applicable.

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable.**Transport/Additional information:**

Not dangerous according to the above specifications.

DOT**Marine Pollutant (DOT):**

No

15 Regulatory information**Safety, health and environmental regulations/legislation specific for the substance or mixture****GHS label elements** The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)**Hazard pictograms**

GHS06

Signal word Danger**Hazard statements**

H301 Toxic if swallowed.

Precautionary statements

P264 Wash thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.

P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/...

P321 Specific treatment (see on this label).

P405 Store locked up.

P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

National regulations

All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.

All components of this product are listed on the Canadian Non-Domestic Substances List (NDSL).

SARA Section 313 (specific toxic chemical listings) Substance is not listed.**California Proposition 65****Prop 65 - Chemicals known to cause cancer** Substance is not listed.**Prop 65 - Developmental toxicity** Substance is not listed.**Prop 65 - Developmental toxicity, female** Substance is not listed.**Prop 65 - Developmental toxicity, male** Substance is not listed.**Information about limitation of use:**

For use only by technically qualified individuals.

This product is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.

Other regulations, limitations and prohibitive regulations**Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006.** Substance is not listed.**The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.**

Substance is not listed.

Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.**Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.**16 Other information**

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department**Date of preparation / last revision** 11/23/2015 / -**Abbreviations and acronyms:**

RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)

IATA-DGR: Dangerous Goods Regulations by the "International Air Transport Association" (IATA)

ICAO: International Civil Aviation Organization

ICAO-TI: Technical Instructions by the "International Civil Aviation Organization" (ICAO)

IMDG: International Maritime Code for Dangerous Goods

DOT: US Department of Transportation

IATA: International Air Transport Association

EINECS: European Inventory of Existing Commercial Chemical Substances

CAS: Chemical Abstracts Service (division of the American Chemical Society)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

vPvB: very Persistent and very Bioaccumulative

ACGIH: American Conference of Governmental Industrial Hygienists (USA)

OSHA: Occupational Safety and Health Administration (USA)

NTP: National Toxicology Program (USA)

IARC: International Agency for Research on Cancer

EPA: Environmental Protection Agency (USA)

USA

ACETOPHENONE**ICSC: 1156 (April 2017)**


1-Phenylethanone
Phenyl methyl ketone
Acetylbenzene

CAS #: 98-86-2**EC Number: 202-708-7**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Above 77°C explosive vapour/air mixtures may be formed.	NO open flames. Above 77°C use a closed system and ventilation.	Use alcohol-resistant foam, powder, carbon dioxide.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Headache. Dizziness. Drowsiness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Nausea. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  WARNING </div> <p>Harmful if swallowed May be harmful in contact with skin Causes eye irritation</p> <p>Transportation UN Classification</p>
STORAGE	
Separated from strong oxidants and strong bases. Ventilation along the floor.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

ACETOPHENONE

ICSC: 1156

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID OR WHITE CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

No data.

Chemical dangers

Reacts with oxidizing materials and strong bases. This generates fire or explosion hazard.

Formula: C_8H_8O / $C_6H_5COCH_3$

Molecular mass: 120.1

Boiling point: 202°C

Melting point: 20°C

Density: 1.03 g/cm³

Solubility in water, g/100ml at 25°C: 0.6 (poor)

Vapour pressure, kPa at 15°C: 0.133

Relative vapour density (air = 1): 4.1

Relative density of the vapour/air-mixture at 20°C (air = 1): 1

Flash point: 77°C c.c.

Auto-ignition temperature: 535°C

Explosive limits, vol% in air: 1 - 5.2 (estimated)

Octanol/water partition coefficient as log Pow: 1.58

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation.

Effects of short-term exposure

The substance is irritating to the eyes. The substance may cause effects on the central nervous system.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA

ENVIRONMENT

Environmental effects of the substance have been adequately investigated, but no significant effects have been found.

NOTES

Use of alcoholic beverages enhances the harmful effect.

ADDITIONAL INFORMATION

EC Classification

Symbol: Xn; R: 22-36; S: (2)-26


All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

ANILINEBenzeneamine
Aminobenzene
Phenylamine**ICSC: 0011 (April 2014)****CAS #: 62-53-3****UN #: 1547****EC Number: 200-539-3**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 76°C explosive vapour/air mixtures may be formed.	NO open flames. NO contact with oxidizing agents. Above 76°C use a closed system and ventilation.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS! STRICT HYGIENE! See Notes.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Vomiting. Weakness. Laboured breathing. Convulsions.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Administration of oxygen may be needed. Refer immediately for medical attention. See Notes.
Skin	EASILY ABSORBED! Redness. Further see Inhalation.	Protective gloves. Protective clothing.	Administration of oxygen may be needed. Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer immediately for medical attention. See Notes.
Eyes	Redness. Pain. Corneal damage.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Administration of oxygen may be needed. Rinse mouth. Do NOT induce vomiting. Rest. Refer immediately for medical attention. See Notes.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p>  <p>DANGER</p> <p>Toxic if swallowed, in contact with skin or if inhaled Causes damage to red blood cells Causes damage to the blood through prolonged or repeated exposure Causes serious eye irritation May cause an allergic skin reaction Very toxic to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II</p>
STORAGE	
Separated from strong oxidants, strong acids and food and feedstuffs. Well closed. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



ANILINE**ICSC: 0011****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS OILY LIQUID WITH CHARACTERISTIC ODOUR.
TURNS BROWN ON EXPOSURE TO AIR OR LIGHT.

Physical dangers**Chemical dangers**

Decomposes above 190°C. This produces toxic and corrosive fumes of nitrogen oxides and ammonia and flammable vapours. Reacts with strong acids and strong oxidants. This generates fire and explosion hazard. Attacks copper and its alloys.

Formula: C_6H_7N / $C_6H_5NH_2$

Molecular mass: 93.1

Boiling point: 184°C

Melting point: -6°C

Relative density (water = 1): 1.02

Solubility in water, g/100ml at 20°C: 3.4

Vapour pressure, Pa at 20°C: 40

Relative vapour density (air = 1): 3.2

Flash point: 76°C c.c.

Auto-ignition temperature: 630°C

Explosive limits, vol% in air: 1.2-11.0

Octanol/water partition coefficient as log Pow: 0.94

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin also as a vapour and by ingestion.

Effects of short-term exposure

The substance is severely irritating to the eyes. The substance may cause effects on the blood. This may result in the formation of methaemoglobin. See Notes. Exposure could cause haemolysis. This may result in haemolytic anaemia. The effects may be delayed. Medical observation is indicated.

Inhalation risk

A harmful contamination of the air will be reached on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. The substance may have effects on the blood. This may result in haemolytic anaemia.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 2 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.

MAK: 7.7 mg/m³, 2 ppm; peak limitation category: II(2); skin absorption (H); sensitization of skin (SH); carcinogen category: 4; pregnancy risk group: C; BAT issued.

EU-OEL: 7,74 mg/m³, 2 ppm as TWA; 19,35 mg/m³, 5 ppm as STEL; (skin)

ENVIRONMENT

The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

In case of blue lips, fingernails or skin treatment with 100% oxygen may be needed; the appropriate means with instructions must be available.

Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.

Specific treatment with antidotes like methylene blue can not be used for pregnant women and persons with a G6PD enzyme deficiency. These people should avoid all contact.

The odour warning when the exposure limit value is exceeded is insufficient.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 23/24/25-40-41-43-48/23/24/25-68-50; S: (1/2)-26-27-36/37/39-45-46-63-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

ANTHRACENE Anthracin Paranaphthalene	ICSC: 0825 (March 1999)
CAS #: 120-12-7	
EC Number: 204-371-1	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use ventilation (not if powder), local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles, face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain.	Do not eat, drink, or smoke during work.	Rinse mouth. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment. Personal protection: P2 filter respirator for harmful particles.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Separated from strong oxidants. Well closed.	
PACKAGING	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

ANTHRACENE**ICSC: 0825****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

WHITE CRYSTALS OR FLAKES.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

Decomposes on heating. Decomposes under the influence of strong oxidants. This produces acrid, toxic fume. This generates fire and explosion hazard.

Formula: C₁₄H₁₀ / (C₆H₄CH)₂

Molecular mass: 178.2

Boiling point: 342°C

Melting point: 218°C

Density: 1.25-1.28 g/cm³

Solubility in water, g/100ml at 20°C: 0.00013

Vapour pressure, Pa at 25°C: 0.08

Relative vapour density (air = 1): 6.15

Flash point: 121°C

Auto-ignition temperature: 538°C

Explosive limits, vol% in air: 0.6-?

Octanol/water partition coefficient as log Pow: 4.5 (calculated)

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation.

Effects of short-term exposure

The substance is mildly irritating to the skin and respiratory tract.

Inhalation risk

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis under the influence of UV light.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT**

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES**ADDITIONAL INFORMATION****EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.


ATRAZINE**ICSC: 0099 (November 2009)**

2-Chloro-4-ethylamino-6-isopropylamino-1,3,5-triazine
 6-Chloro-N-ethyl-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine
 2-Chloro-4-ethylamino-6-isopropylamino-s-triazine

CAS #: 1912-24-9**EC Number: 217-617-8**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion if formulations contain flammable/explosive solvents.	NO open flames.	Use water spray, foam, powder, carbon dioxide.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use ventilation (not if powder).	Fresh air, rest.
Skin		Protective gloves.	Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  WARNING Causes serious eye irritation May cause damage to liver through prolonged or repeated exposure Toxic to aquatic life Transportation UN Classification
STORAGE	
Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021



European
Commission

ATRAZINE**ICSC: 0099****PHYSICAL & CHEMICAL INFORMATION**

Physical State; Appearance
COLOURLESS CRYSTALS.

Physical dangers
No data.

Chemical dangers
Decomposes on heating. This produces toxic fumes including hydrogen chloride and nitrogen oxides.

Formula: $C_8H_{14}ClN_5$
Molecular mass: 215.7
Boiling point: No boiling point at normal pressure; decomposes on heating
See Notes.
Melting point: 173-177°C
Relative density (water = 1): 1.2
Solubility in water, g/100ml at 25°C: (none)
Vapour pressure, Pa at 20°C: (negligible)
Octanol/water partition coefficient as log Pow: 2.34

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by ingestion.

Effects of short-term exposure
The substance is severely irritating to the eyes.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
The substance may have effects on the liver. This may result in tissue lesions.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 2 mg/m³, as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 1 mg/m³; peak limitation category: II(2); pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

Temperature of decomposition is unknown in the literature.
Carrier solvents used in commercial formulations may change physical and toxicological properties.
If the substance is formulated with solvent(s) also consult the card(s) (ICSC) of the solvent(s).

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 43-48/22-50/53; S: (2)-36/37-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

BENZ(a)ANTHRACENE**ICSC: 0385 (November 2016)**


1,2-Benzoanthracene
Benzo(a)anthracene
2,3-Benzphenanthrene
Naphthanthracene

CAS #: 56-55-3**UN #: 3077****EC Number: 200-280-6**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Finely dispersed particles form explosive mixtures in air.	NO contact with oxidizing agents. NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, carbon dioxide, foam. In case of fire in the surroundings, use appropriate extinguishing media.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety goggles, face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Seek medical attention if you feel unwell.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: complete protective clothing including self-contained breathing apparatus. Wet powder to prevent dusting and ignition. Do NOT let this chemical enter the environment. Vacuum spilled material with specialist equipment. Sweep spilled substance into sealable containers. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>May cause cancer Very toxic to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III</p>
STORAGE	
Separated from oxidizing materials. Store in an area without drain or sewer access. Well closed.	
PACKAGING	
Marine pollutant.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



BENZ(a)ANTHRACENE**ICSC: 0385****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS-TO-YELLOW-BROWN FLUORESCENT FLAKES OR POWDER.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

Reacts with oxidizing substances.

Formula: C₁₈H₁₂

Molecular mass: 228.3

Sublimation point: 435°C

Melting point: 162°C

Relative density (water = 1): 1.274

Solubility in water: none

Vapour pressure, Pa at 20°C: 292

Octanol/water partition coefficient as log Pow: 5.61

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin, by ingestion and through the eyes.

Effects of short-term exposure

See Notes.

Inhalation risk

A nuisance-causing concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

This substance is probably carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: A2 (suspected human carcinogen); BEI issued.

MAK skin absorption (H).

MAK: carcinogen category: 2; germ cell mutagen group: 3A

ENVIRONMENT

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. Bioaccumulation of this chemical may occur in aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.
Do NOT take working clothes home.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 45-50/53; S: 53-45-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

BENZALDEHYDE

ICSC: 0102 (April 2006)

Benzoic aldehyde
Artificial almond oil
Benzenecarbonal


CAS #: 100-52-7

UN #: 1990

EC Number: 202-860-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 63°C explosive vapour/air mixtures may be formed.	NO open flames. Above 63°C use a closed system and ventilation.	Use water spray, foam, powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety spectacles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Sore throat.	Do not eat, drink, or smoke during work.	Rinse mouth. Rest.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>WARNING</p> </div> <p>Flammable liquid and vapour Harmful if swallowed or in contact with skin Toxic to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III</p>
STORAGE	
Separated from incompatible materials. See Chemical Dangers. Well closed. Ventilation along the floor. Cool. Store in an area without drain or sewer access. Keep in the dark.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

BENZALDEHYDE**ICSC: 0102****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS-TO-YELLOW LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

The substance can form explosive peroxides under special conditions. Reacts violently with aluminium, bases, iron, oxidants and phenol. This generates fire and explosion hazard.

Formula: C₇H₆O / C₆H₅CHO

Molecular mass: 106.1

Boiling point: 179°C

Melting point: -26°C

Relative density (water = 1): 1.05

Solubility in water at 25°C: poor

Vapour pressure, Pa at 26°C: 133

Relative vapour density (air = 1): 3.7

Flash point: 63°C c.c.

Auto-ignition temperature: 192°C

Explosive limits, vol% in air: 1.4

Octanol/water partition coefficient as log Pow: 1.48

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes.

Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS****ENVIRONMENT**

The substance is harmful to aquatic organisms.

NOTES

Rinse contaminated clothing with plenty of water because of fire hazard.

Check for peroxides prior to distillation; eliminate if found.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn; R: 22; S: (2)-24

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

BENZIDINE

ICSC: 0224 (November 2009)

(1,1'-Biphenyl)-4,4'-diamine
 4,4'-Diaminobiphenyl
 p-Diaminodiphenyl
 Biphenyl-4,4'-ylenediamine

CAS #: 92-87-5


UN #: 1885

EC Number: 202-199-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, foam, powder, carbon dioxide.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use closed system and ventilation.	Fresh air, rest.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Wear protective gloves when administering first aid.
Eyes		Wear face shield or eye protection in combination with breathing protection if powder.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>Harmful if swallowed Suspected of causing genetic defects May cause cancer Very toxic to aquatic life with long lasting effects</p>
STORAGE	
Provision to contain effluent from fire extinguishing. Separated from strong oxidants and food and feedstuffs. Keep in the dark. Well closed. Store in an area without drain or sewer access.	
PACKAGING	
Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.	<p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II</p>



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021



European
Commission

BENZIDINE**ICSC: 0224****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS OR REDDISH CRYSTALLINE POWDER. TURNS DARK ON EXPOSURE TO AIR AND LIGHT.

Physical dangers

No data.

Chemical dangers

Decomposes on heating and on burning. This produces toxic fumes including nitrogen oxides. Reacts violently with strong oxidants, especially nitric acid.

Formula: $C_{12}H_{12}N_2$ / $NH_2C_6H_4-C_6H_4NH_2$

Molecular mass: 184.2

Boiling point: 401°C

Melting point: 120°C

Density: 1.3 g/cm³

Solubility in water, g/100ml at 25°C: <0.05 (very poor)

Relative vapour density (air = 1): 6.4

Octanol/water partition coefficient as log Pow: 1.34

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Effects of short-term exposure**Inhalation risk**

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure

This substance is carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: A1 (confirmed human carcinogen); (skin).

MAK: carcinogen category: 1.

MAK skin absorption (H)

ENVIRONMENT

The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Do NOT take working clothes home.

TLV Note: Exposure by all routes should be carefully controlled to levels as low as possible.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 45-22-50/53; S: 53-45-60-61; Note: E


All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

BENZO(a)PYRENE**ICSC: 0104 (April 2014)**Benz(a)pyrene
3,4-Benzopyrene
Benzo(d,e,f)chrysene**CAS #: 50-32-8****UN #: 3077****EC Number: 200-028-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

See Notes. AVOID ALL CONTACT! PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use closed system and ventilation.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p>  <p>DANGER</p> <p>May cause an allergic skin reaction May cause cancer May cause genetic defects May damage fertility or the unborn child Very toxic to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III</p>
STORAGE	
Provision to contain effluent from fire extinguishing. Separated from strong oxidants. Store in an area without drain or sewer access. Cool. Dry.	
PACKAGING	
Marine pollutant.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

BENZO(a)PYRENE**ICSC: 0104****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

PALE YELLOW CRYSTALS.

Physical dangers**Chemical dangers**

Reacts with strong oxidants. Decomposes on heating. This produces toxic fumes.

Formula: C₂₀H₁₂

Molecular mass: 252.3

Boiling point: 496°C

Melting point: 178.1°C

Density (at 20°C): 1.4 g/cm³

Solubility in water, g/100ml at 20°C: < 0.1 (poor)

Vapour pressure at 20°C: negligible

Octanol/water partition coefficient as log Pow: 6.04

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

Exposure mainly occurs via inhalation.

Effects of short-term exposure

See Notes.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells. May cause toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: A2 (suspected human carcinogen); BEI issued.

MAK: skin absorption (H); carcinogen category: 2; germ cell mutagen group: 2

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish, plants and molluscs. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

Do NOT take working clothes home.

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

Benzo(a)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAHs) in the environment, usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 45-46-60-61-43-50/53; S: 53-45-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

BENZO(b)FLUORANTHENE**ICSC: 0720 (March 1999)**

Benz(e)acephenanthrylene
 2,3-Benzofluoranthene
 Benzo(e)fluoranthene
 3,4-Benzofluoranthene

CAS #: 205-99-2**EC Number: 205-911-9**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION			In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Provision to contain effluent from fire extinguishing. Well closed.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021



European
Commission

BENZO(b)FLUORANTHENE**ICSC: 0720****PHYSICAL & CHEMICAL INFORMATION**

Physical State; Appearance
COLOURLESS CRYSTALS.

Physical dangers**Chemical dangers**

Upon heating, toxic fumes are formed. Decomposes on heating. This produces toxic fumes.

Formula: C₂₀H₁₂
Molecular mass: 252.3
Boiling point: 481°C
Melting point: 168°C
Solubility in water: none
Octanol/water partition coefficient as log Pow: 6.12

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

Effects of short-term exposure**Inhalation risk**

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure

This substance is possibly carcinogenic to humans. May cause genetic damage in humans.

OCCUPATIONAL EXPOSURE LIMITS

MAK: skin absorption (H); carcinogen category: 2; germ cell mutagen group: 3B

ENVIRONMENT

This substance may be hazardous to the environment. Special attention should be given to air quality and water quality.

NOTES

Benzo(b)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco. ACGIH recommends environment containing benzo(b)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m³.

TLV Note: Exposure by all routes should be carefully controlled to levels as low as possible.

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 45-50/53; S: 53-45-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

BENZO(ghi)PERYLENE**ICSC: 0739 (October 1999)**

1,12-Benzoperylene

1,12-Benzperylene

CAS #: 191-24-2**EC Number: 205-883-8**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions.	NO open flames.	In case of fire in the surroundings, use appropriate extinguishing media.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Well closed.	
PACKAGING	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



BENZO(ghi)PERYLENE**ICSC: 0739****PHYSICAL & CHEMICAL INFORMATION**

Physical State; Appearance
PALE YELLOW-GREEN CRYSTALS.

Physical dangers**Chemical dangers**

Upon heating, toxic fumes are formed. Decomposes on heating. This produces toxic fumes.

Formula: C₂₂H₁₂
Molecular mass: 276.3
Boiling point: 550°C
Melting point: 278°C
Density: 1.3 g/cm³
Solubility in water: none
Octanol/water partition coefficient as log Pow: 6.58

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

Effects of short-term exposure**Inhalation risk**

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS****ENVIRONMENT**

This substance may be hazardous to the environment. Special attention should be given to air quality and water quality.

NOTES

Benzo(ghi)perylene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.
Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

BENZO(k)FLUORANTHENE**ICSC: 0721 (March 1999)**

Dibenzo(b,j,k)fluorene
8,9-Benzofluoranthene
11,12-Benzofluoranthene

CAS #: 207-08-9**EC Number: 205-916-6**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION			In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Provision to contain effluent from fire extinguishing. Well closed.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

BENZO(k)FLUORANTHENE**ICSC: 0721****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

YELLOW CRYSTALS.

Physical dangers**Chemical dangers**

Upon heating, toxic fumes are formed. Decomposes on heating. This produces toxic fumes.

Formula: C₂₀H₁₂

Molecular mass: 252.3

Boiling point: 480°C

Melting point: 217°C

Solubility in water: none

Octanol/water partition coefficient as log Pow: 6.84

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

Effects of short-term exposure**Inhalation risk**

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure

This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

MAK: skin absorption (H); carcinogen category: 2; germ cell mutagen group: 3B

ENVIRONMENT

This substance may be hazardous to the environment. Special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in crustacea and fish.

NOTES

Benzo(k)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco. ACGIH recommends environment containing benzo(k)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m³. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 45-50/53; S: 53-45-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

BENZOIC ACID**ICSC: 0103 (October 1999)**Benzenecarboxylic acid
Phenyl carboxylic acid**CAS #: 65-85-0****EC Number: 200-618-2**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness. Burning sensation. Itching.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: protective clothing and face shield. Sweep spilled substance into covered plastic containers. If appropriate, moisten first to prevent dusting. Wash away remainder with plenty of water.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
PACKAGING	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

BENZOIC ACID**ICSC: 0103****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

WHITE CRYSTALS OR POWDER.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

The solution in water is a weak acid. Reacts with oxidants.

Formula: $C_7H_6O_2$ / C_6H_5COOH

Molecular mass: 122.1

Boiling point: 249°C

Melting point: 122°C

See Notes.

Density: 1.3 g/cm³

Solubility in water, g/100ml at 20°C: 0.29

Vapour pressure, Pa at 25°C: 0.1

Relative vapour density (air = 1): 4.2

Relative density of the vapour/air-mixture at 20°C (air = 1): 1

Flash point: 121°C c.c.

Auto-ignition temperature: 570°C

Octanol/water partition coefficient as log Pow: 1.87

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. Exposure could cause a non-allergic rash on contact.

Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS**MAK: (respirable fraction): 0.5 mg/m³, 0.1 ppm; peak limitation category: II(4); skin absorption (H); pregnancy risk group: C**ENVIRONMENT****NOTES**

The substance begins to sublime at 100°C.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

BENZYL ALCOHOL**ICSC: 0833 (April 2000)**

Benzenemethanol
Phenyl carbinol
alpha-Hydroxytoluene
Benzoyl alcohol
Phenyl methanol

CAS #: 100-51-6**EC Number: 202-859-9**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use powder, AFFF, foam, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Dizziness. Headache.	Use ventilation.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again.
Eyes	Redness.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Drowsiness. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Separated from strong oxidants.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

BENZYL ALCOHOL**ICSC: 0833****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Reacts with strong oxidants. Attacks some forms of plastic. On combustion, forms toxic gases including carbon monoxide.

Formula: C_7H_8O / $C_6H_5CH_2OH$

Molecular mass: 108.1

Boiling point: 205°C

Melting point: -15°C

Relative density (water = 1): 1.04

Solubility in water, g/100ml: 4

Vapour pressure, Pa at 20°C: 13.2

Relative vapour density (air = 1): 3.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0

Flash point: 93°C c.c.

Auto-ignition temperature: 436°C

Explosive limits, vol% in air: 1.3-13

Octanol/water partition coefficient as log Pow: 1.1

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure

The aerosol is irritating to the eyes and skin. The substance may cause effects on the nervous system.

Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization.

OCCUPATIONAL EXPOSURE LIMITSMAK: 22 mg/m³, 5 ppm; peak limitation category: I(2); skin absorption (H); pregnancy risk group: C**ENVIRONMENT**

The substance is toxic to aquatic organisms.

NOTES**ADDITIONAL INFORMATION****EC Classification**

Symbol: Xn; R: 20/22; S: (2)-26

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

Matrix Scientific

PO BOX 25067

COLUMBIA, SC 29224-5067

Telephone: 803-788-9494

Fax: 803-788-9419

SAFETY DATA SHEET

Transportation Emergency: 3E Co. (5025) 800-451-8346

1. Product Identification

Name Bis(2-chloroethoxy)methane
Catalog Number 007514
CAS Registry Number [111-91-1]
Company Matrix Scientific
Physical Address 131 Pontiac Business Center Drive
Elgin, SC 29045
USA
Telephone/Fax (803)788-9494/(803)788-9419

2. Hazard Identification

Hazardous Ingredients Bis(2-chloroethoxy)methane

GHS label elements, including precautionary statements

Pictogram



Signal word WARNING

Hazard statement(s)

H302 Harmful if swallowed
H315 Causes skin irritation
H317 H317 May cause an allergic skin reaction
H319 Causes serious eye irritation
H319 Causes serious eye irritation
H332 Harmful if inhaled
H335 May cause respiratory irritation

Precautionary statement(s)

P233 Keep container tightly closed.
P261 Avoid breathing dust/fume/ gas/mist/vapours/spray.
P264 Wash ... thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P305+351+338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do - continue rinsing.

3. Composition, Information or Ingredients

Name Bis(2-chloroethoxy)methane

4. First Aid Measures

Eye Contact:	Check for and remove any contact lenses. Immediately flush eyes with clean, running water for at least 15 minutes while keeping eyes open. Cool water may be used. Seek medical attention.
Skin Contact:	After contact with skin, wash with generous quantities of running water. Gently and thoroughly wash affected area with running water and non-abrasive soap. Cool water may be used. Cover the affected area with emollient. Seek medical attention. Wash any contaminated clothing prior to reusing.
Inhalation:	Remove the victim from the source of exposure to fresh, uncontaminated air. If victim's breathing is difficult, administer oxygen. Seek medical attention.
Ingestion:	Do NOT induce vomiting. Give water to victim to drink. Seek medical attention.

5. Fire-Fighting Measures

Extinguishing media:	Carbon dioxide, dry chemical powder, alcohol or polymer foam.
Special fire fighting procedures:	Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Unusual fire and explosion hazards/decomposition of product:	Emits toxic fumes under fire conditions.

6. Accidental Release Measures

Steps to be taken if material is spilled or otherwise released into the environment - Wear Appropriate respirator, impervious boots and heavy rubber (or otherwise impervious) gloves. Scoop up solid material or absorb liquid material and place into appropriate container. Ventilate area and wash affected spill area after pickup is complete. Wash skin immediately with plenty of water. Place solid or absorbed material into containers and close for disposal.

7. Handling and Storage

Avoid prolonged exposure.
Use caution when handling.
Exposure to any chemical should be limited.
Do not breath dust or vapor.
Have safety shower and eye wash available.
Do not get in eyes, on skin or on clothing.
Keep container tightly closed.
Store in a cool, dry, well-ventilated place.

Ensure adequate ventilation during use.
Use only in a chemical fume hood.
To the best of our knowledge, the health hazards of this product have not been fully investigated.
This product is provided solely for the purpose of research and development.

8. **Exposure Controls and Personal Protection**

Wear Protective safety goggles.
Wear chemical-resistant gloves.
Wear protective clothing and chemical resistant boots.
Ensure ventilation during use.
After contact with skin, wash immediately.

9. **Physical and Chemical Properties**

Appearance: liquid
Molecular Formula: C₅H₁₀Cl₂O₂
Molecular Weight: 173.04
Boiling point (C): 112°/20mm(217°)
Melting point (C): -32°
Density (g/ml): 1.23
Index of refraction: 1.45

10. **Stability and Reactivity**

Incompatibilities: Strong oxidizing agents
Strong acids and bases

Hazard Decomposition Products

Carbon	carbon monoxide carbon dioxide
Chlorine	hydrogen chloride

11. **Toxicological Information**

Acute effects:

Irritant
May be harmful by ingestion and inhalation.
Material is irritating to mucous membranes and upper respiratory tract.
To the best of our knowledge, the toxicological properties of this product have not been fully investigated or determined.

12. **Ecological Information**

Mobility:	Data not known
Persistence and degradability:	No data available
Cumulative potential:	No data available

Other adverse effects: No data available

13. Disposal Considerations

Absent other actions demanded by federal or local regulations - Dissolve or mix the material with a combustible solvent and burn in a regulated, chemical incinerator equipped with after burner and scrubber.

Observe all federal, state and local laws.

14. Transport Information

Shipping Name Classed non-hazardous for shipment

15. Regulatory Information

Adhere to all Federal, State and local regulations.

16. Other Information

The information contained herein is accurate to the best of our knowledge, but is not meant to be complete and is included only as a guide. The end user is responsible for any damage resulting from handling or from contact with this product.

BIS(2-CHLOROETHYL) ETHER**ICSC: 0417 (April 2000)**

Dichloroethyl ether
 2,2'-Dichloroethyl ether
 1,1'-Oxybis(2-chloro)ethane
 sym-Dichloroethyl ether
 Diethylene glycol dichloride

CAS #: 111-44-4**UN #: 1916****EC Number: 203-870-1**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Gives off irritating or toxic fumes (or gases) in a fire. Above 55°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 55°C use a closed system and ventilation.	Use water spray, foam, powder, carbon dioxide. In case of fire: keep cylinder cool by spraying with water. NO direct contact with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Nausea. Vomiting. Burning sensation. Laboured breathing. Symptoms may be delayed. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer for medical attention.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Nausea. Vomiting. Burning sensation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Rest. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit. Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Subsidiary Risks: 3; UN Pack Group: II
STORAGE	
Fireproof. Separated from food and feedstuffs. See Chemical Dangers. Keep in the dark. Well closed.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021



BIS(2-CHLOROETHYL) ETHER**ICSC: 0417****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

CLEAR COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air.

Chemical dangers

The substance can form explosive peroxides on exposure to air and light. Decomposes on burning. Decomposes on contact with water. This produces toxic fumes including hydrogen chloride. Reacts with strong oxidants. Reacts violently with chlorosulfonic acid and oleum.

Formula: $C_4H_8Cl_2O$ / $(ClCH_2CH_2)_2O$

Molecular mass: 143.02

Boiling point: 178°C

Melting point: -50°C

Relative density (water = 1): 1.22

Vapour pressure, kPa at 25°C: 0.206

Relative vapour density (air = 1): 4.9

Flash point: 55°C c.c.

Auto-ignition temperature: 369°C

Explosive limits, vol% in air: 2.7-?

Octanol/water partition coefficient as log Pow: 1.29

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. Inhalation of the vapour may cause lung oedema. See Notes. Exposure far above the OEL could cause death. The effects may be delayed. Medical observation is indicated.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as TWA; 10 ppm as STEL; (skin); A4 (not classifiable as a human carcinogen).

MAK: 59 mg/m³, 10 ppm; peak limitation category: I(1); skin absorption (H)

ENVIRONMENT**NOTES**

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort.

Rest and medical observation are therefore essential.

Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered.

An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

Check for peroxides prior to distillation; eliminate if found.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T+; R: 10-26/27/28-40; S: (1/2)-7/9-27-28-36/37-45

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

DICHLOROISOPROPYL ETHER**ICSC: 0435 (November 2003)**

Bis(2-chloro-1-methylethyl) ether
 2,2'-Oxybis(1-chloropropane)
 Dichlorodiisopropyl ether

CAS #: 108-60-1**UN #: 2490****EC Number: 203-598-3**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 85°C explosive vapour/air mixtures may be formed.	NO open flames. Above 85°C use a closed system and ventilation.	Use water spray, foam, alcohol-resistant foam, dry powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust.	Fresh air, rest.
Skin	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Give one or two glasses of water to drink.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
<p>Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance.</p> <p>Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable plastic containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.</p>	<p>According to UN GHS Criteria</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II</p>
STORAGE	
Cool. Keep in the dark. Separated from incompatible materials. See Chemical Dangers.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021



European
Commission

DICHLOROISOPROPYL ETHER**ICSC: 0435****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS-TO-BROWN OILY LIQUID.

Physical dangers**Chemical dangers**

The substance can form explosive peroxides on standing in contact with air. Reacts with halogens, strong acids and strong oxidants. Decomposes on burning. This produces toxic fumes.

Formula: $C_6H_{12}Cl_2O$ / $(ClCH_2C(CH_3)_2)_2O$

Molecular mass: 171.1

Boiling point: 187°C

Melting point: -97 - -102°C

Relative density (water = 1): 1.1

Solubility in water, g/100ml at 20°C: 0.2 (poor)

Vapour pressure, Pa at 20°C: 75

Relative vapour density (air = 1): 6

Flash point: 85°C o.c.

Octanol/water partition coefficient as log Pow: 2.14/2.58

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

See Notes.

Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT**

Environmental effects from the substance have not been investigated adequately.

NOTES

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

BUTYL BENZYL PHTHALATE**ICSC: 0834 (October 2005)**

Benzyl butyl phthalate
1,2-Benzenedicarboxylic acid, butyl phenylmethyl ester
BBP

CAS #: 85-68-7**UN #: 3082****EC Number: 201-622-7**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use alcohol-resistant foam, powder, carbon dioxide, water spray.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. PREVENT GENERATION OF MISTS! AVOID EXPOSURE OF (PREGNANT) WOMEN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III
STORAGE	
Store in an area without drain or sewer access. Separated from strong oxidants.	
PACKAGING	
Marine pollutant.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

BUTYL BENZYL PHTHALATE**ICSC: 0834****PHYSICAL & CHEMICAL INFORMATION**

Physical State; Appearance
COLOURLESS OILY LIQUID.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces toxic fumes. Reacts with oxidants.

Formula: 1,2-C₆H₄(COOCH₂C₆H₅)(COOC₄H₉) / C₁₉H₂₀O₄

Molecular mass: 312.4

Boiling point: 370°C

Melting point: -35°C

Relative density (water = 1): 1.1

Solubility in water, mg/l: 0.71 (very poor)

Vapour pressure at 20°C: negligible

Relative vapour density (air = 1): 10.8

Flash point: 198°C

Auto-ignition temperature: 425°C

Octanol/water partition coefficient as log Pow: 4.77

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Effects of short-term exposure**Inhalation risk**

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.

Effects of long-term or repeated exposure

Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

MAK: (inhalable fraction): 20 mg/m³; peak limitation category: II(2); pregnancy risk group: C

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES**ADDITIONAL INFORMATION****EC Classification**

Symbol: T, N; R: 61-62-50/53; S: 45-53-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.


CAPROLACTAM**ICSC: 0118 (November 2009)**

Hexahydro-2H-azepin-2-one
Aminocaproic lactam
epsilon-Caprolactam

CAS #: 105-60-2**EC Number: 203-313-2**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use foam, powder, carbon dioxide, water in large amounts.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Abdominal cramps. Dizziness. Headache. Confusion.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.
Ingestion	Nausea. Vomiting. Abdominal pain. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Let solidify. Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Wash away remainder with plenty of water.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  WARNING </div> <p>Harmful if swallowed Causes skin and eye irritation May cause drowsiness or dizziness</p> <p>Transportation UN Classification</p>
STORAGE	
Separated from strong oxidants. Dry.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

CAPROLACTAM

ICSC: 0118

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

WHITE HYGROSCOPIC CRYSTALS OR FLAKES.

Physical dangers

No data.

Chemical dangers

Decomposes on heating. This produces toxic fumes including nitrogen oxides and ammonia. Reacts violently with strong oxidants. This produces toxic fumes.

Formula: $C_6H_{11}NO$

Molecular mass: 113.2

Boiling point: 267°C

Melting point: 70°C

Relative density (water = 1): 1.02

Solubility in water: good

Vapour pressure, Pa at 25°C: 0.26

Relative vapour density (air = 1): 3.91

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0

Flash point: 125°C o.c.

Auto-ignition temperature: 375°C

Explosive limits, vol% in air: 1.4-8

Octanol/water partition coefficient as log Pow: -0.19

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol.

Effects of short-term exposure

The substance is irritating to the skin, eyes and respiratory tract. The substance may cause effects on the central nervous system.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the nervous system and liver.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 mg/m³, as TWA; A5 (not suspected as a human carcinogen).

MAK: (inhalable fraction): 5 mg/m³; peak limitation category: I(2); pregnancy risk group: C.

EU-OEL: 10 mg/m³ as TWA; 40 mg/m³ as STEL

ENVIRONMENT

This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

The substance is usually used, stored and transported in liquefied (molten) form at about 80°C.

ADDITIONAL INFORMATION

EC Classification

Symbol: Xn; R: 20/22-36/37/38; S: (2)

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1 Identification

Product identifier

Product name: Carbazole

Stock number: L03718

CAS Number:

86-74-8

EC number:

201-696-0

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Manufacturer/Supplier:

Alfa Aesar

Thermo Fisher Scientific Chemicals, Inc.

30 Bond Street

Ward Hill, MA 01835-8099

Tel: 800-343-0660

Fax: 800-322-4757

Email: tech@alfa.com

www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)



GHS08 Health hazard

Carc. 2 H351 Suspected of causing cancer.

Hazards not otherwise classified No information known.

Label elements

GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)

Hazard pictograms



GHS08

Signal word

Warning

Hazard statements

H351 Suspected of causing cancer.

Precautionary statements

P281 Use personal protective equipment as required.

P201 Obtain special instructions before use.

P202 Do not handle until all safety precautions have been read and understood.

P308+P313 IF exposed or concerned: Get medical advice/attention.

P405 Store locked up.

P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

WHMIS classification

D2A - Very toxic material causing other toxic effects



Classification system

HMIS ratings (scale 0-4)

(Hazardous Materials Identification System)

HEALTH 1 Health (acute effects) = 1

FIRE 1 Flammability = 1

REACTIVITY 1 Physical Hazard = 1

Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances

CAS# Description:

86-74-8 Carbazole

Identification number(s):

EC number: 201-696-0

4 First-aid measures

Description of first aid measures

After inhalation

Supply fresh air. If required, provide artificial respiration. Keep patient warm.

Seek immediate medical advice.

After skin contact

Immediately wash with water and soap and rinse thoroughly.

Seek immediate medical advice.

After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing Seek medical treatment.

Product name: Carbazole

(Contd. of page 1)

Information for doctor

Most important symptoms and effects, both acute and delayed No further relevant information available.

Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

Special hazards arising from the substance or mixture

If this product is involved in a fire, the following can be released:

Carbon monoxide and carbon dioxide

Nitrogen oxides (NOx)

Advice for firefighters

Protective equipment:

Wear self-contained respirator.

Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Wear protective equipment. Keep unprotected persons away.

Ensure adequate ventilation

Environmental precautions: Do not allow material to be released to the environment without proper governmental permits.

Methods and material for containment and cleaning up: Dispose of contaminated material as waste according to section 13.

Prevention of secondary hazards: No special measures required.

Reference to other sections

See Section 7 for information on safe handling

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

7 Handling and storage

Handling

Precautions for safe handling

Keep container tightly sealed.

Store in cool, dry place in tightly closed containers.

Ensure good ventilation at the workplace.

Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities

Storage

Requirements to be met by storerooms and receptacles: No special requirements.

Information about storage in one common storage facility: Store away from oxidizing agents.

Further information about storage conditions:

Keep container tightly sealed.

Store in cool, dry conditions in well sealed containers.

Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:

Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace:

The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.

Additional information: No data

Exposure controls

Personal protective equipment

General protective and hygienic measures

The usual precautionary measures for handling chemicals should be followed.

Keep away from foodstuffs, beverages and feed.

Remove all soiled and contaminated clothing immediately.

Wash hands before breaks and at the end of work.

Maintain an ergonomically appropriate working environment.

Breathing equipment: Use suitable respirator when high concentrations are present.

Protection of hands:

Impervious gloves

Check protective gloves prior to each use for their proper condition.

The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Penetration time of glove material (in minutes) Not determined

Eye protection: Safety glasses

Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance:

Form: Powder

Color: White to pale brown

Odor: Odorless

Odor threshold: Not determined.

pH-value: Not applicable.

Change in condition

Melting point/Melting range: 240-246 °C (464-475 °F)

Boiling point/Boiling range: 354-356 °C (669-673 °F)

Sublimation temperature / start: Not determined

Flash point: 220 °C (428 °F)

Flammability (solid, gaseous) Not determined.

Ignition temperature: Not determined

Decomposition temperature: Not determined

(Contd. on page 3)
USA

Product name: Carbazole

(Contd. of page 2)

Auto igniting:	Not determined.
Danger of explosion:	Not determined.
Explosion limits:	
Lower:	Not determined
Upper:	Not determined
Vapor pressure:	Not applicable.
Density at 20 °C (68 °F):	1.15 g/cm ³ (9.597 lbs/gal)
Relative density	Not determined.
Vapor density	Not applicable.
Evaporation rate	Not applicable.
Solubility in / Miscibility with	
Water:	Insoluble
Partition coefficient (n-octanol/water):	Not determined.
Viscosity:	
dynamic:	Not applicable.
kinematic:	Not applicable.
Other information	No further relevant information available.

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions Reacts with strong oxidizing agents
Conditions to avoid No further relevant information available.
Incompatible materials: Oxidizing agents
Hazardous decomposition products:
Carbon monoxide and carbon dioxide
Nitrogen oxides

11 Toxicological information

Information on toxicological effects
Acute toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.
LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: May cause irritation
Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains mutation data for this substance.
Carcinogenicity:
Suspected of causing cancer.
IARC-3: Not classifiable as to carcinogenicity to humans.
Reproductive toxicity: No effects known.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Ecotoxical effects:
Remark: Very toxic for aquatic organisms
Additional ecological information:
General notes:
Do not allow material to be released to the environment without proper governmental permits.
Do not allow product to reach ground water, water course or sewage system, even in small quantities.
Danger to drinking water if even extremely small quantities leak into the ground.
Also poisonous for fish and plankton in water bodies.
May cause long lasting harmful effects to aquatic life.
Avoid transfer into the environment.
Very toxic for aquatic organisms
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

UN-Number	
DOT, IMDG, IATA	UN3077
UN proper shipping name	
DOT	Environmentally hazardous substances, solid, n.o.s. (Carbazole)
IMDG, IATA	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Carbazole)

(Contd. on page 4)
USA

Product name: **Carbazole**

(Contd. of page 3)

Transport hazard class(es)

DOT, IMDG

Class
Label
Class
Label
IATA9 Miscellaneous dangerous substances and articles.
9
9 (M7) Miscellaneous dangerous substances and articles
9Class
Label9 Miscellaneous dangerous substances and articles.
9Packing group
DOT, IMDG, IATA

III

Environmental hazards:
Special marking (ADR):
Special marking (IATA):Symbol (fish and tree)
Symbol (fish and tree)

Special precautions for user

Warning: Miscellaneous dangerous substances and articles

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Not applicable.

Transport/Additional information:

DOT

Marine Pollutant (DOT):

No

UN "Model Regulation":

UN3077, Environmentally hazardous substances, solid, n.o.s. (Carbazole), 9, III

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture

GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)

Hazard pictograms



GHS08

Signal word Warning

Hazard statements

H351 Suspected of causing cancer.

Precautionary statements

P281 Use personal protective equipment as required.

P201 Obtain special instructions before use.

P202 Do not handle until all safety precautions have been read and understood.

P308+P313 IF exposed or concerned: Get medical advice/attention.

P405 Store locked up.

P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

National regulations

All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.

All components of this product are listed on the Canadian Domestic Substances List (DSL).

SARA Section 313 (specific toxic chemical listings) Substance is not listed.

California Proposition 65

Prop 65 - Chemicals known to cause cancer

86-74-8 Carbazole

Prop 65 - Developmental toxicity Substance is not listed.

Prop 65 - Developmental toxicity, female Substance is not listed.

Prop 65 - Developmental toxicity, male Substance is not listed.

Information about limitation of use: For use only by technically qualified individuals.

Other regulations, limitations and prohibitive regulations

Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.

Substance is not listed.

Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.

Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department

Date of preparation / last revision 11/23/2015 / -

Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)

IMDG: International Maritime Code for Dangerous Goods

DOT: US Department of Transportation

IATA: International Air Transport Association

EINECS: European Inventory of Existing Commercial Chemical Substances

CAS: Chemical Abstracts Service (division of the American Chemical Society)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

vPvB: very Persistent and very Bioaccumulative

ACGIH: American Conference of Governmental Industrial Hygienists (USA)

OSHA: Occupational Safety and Health Administration (USA)

NTP: National Toxicology Program (USA)

IARC: International Agency for Research on Cancer

EPA: Environmental Protection Agency (USA)

CHRYSENE

ICSC: 1672 (October 2006)

Benzo[a]phenanthrene
1,2-Benzophenanthrene
1,2,5,6-Dibenzonaphthalene

CAS #: 218-01-9


UN #: 3077

EC Number: 205-923-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, dry powder, foam, carbon dioxide.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  </div> <p>WARNING</p> <p>Suspected of causing cancer Very toxic to aquatic life Toxic to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III</p>
STORAGE	
Separated from strong oxidants. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	



International
Labour
Organization

World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

CHRYSENE**ICSC: 1672****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS-TO-BEIGE CRYSTALS OR POWDER.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

Decomposes on burning. This produces toxic fumes. Reacts violently with strong oxidants.

Formula: C₁₈H₁₂

Molecular mass: 228.3

Boiling point: 448°C

Melting point: 254 - 256°C

Density: 1.3 g/cm³

Solubility in water: very poor

Octanol/water partition coefficient as log Pow: 5.9

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Effects of short-term exposure**Inhalation risk**

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.

MAK: skin absorption (H); carcinogen category: 2

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in seafood. It is strongly advised not to let the chemical enter into the environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

Do NOT take working clothes home.

This substance does not usually occur as a pure substance but as a component of polyaromatic hydrocarbon (PAH) mixtures.

Human population studies have associated PAH's exposure with cancer and cardiovascular diseases.

TLV Note: Exposure by all routes should be carefully controlled to levels as low as possible.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 45-68-50/53; S: 53-45-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

DI(2-ETHYLHEXYL) PHTHALATE**ICSC: 0271 (October 2001)**

Diethylphthalate
DOP; DEHP
Bis-(2-ethylhexyl)phthalate

CAS #: 117-81-7**EC Number: 204-211-0**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, foam, powder, carbon dioxide.

PREVENT GENERATION OF MISTS! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal cramps. Diarrhoea. Nausea.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give one or two glasses of water to drink.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Separated from strong oxidants, acids, alkalis and nitrates. Cool. Dry. Well closed.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

DI(2-ETHYLHEXYL) PHTHALATE**ICSC: 0271****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS-TO-LIGHT COLOURED VISCOUS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Decomposes on heating. This produces irritating fumes. Reacts with strong oxidants, acids, alkalis and nitrates.

Formula: $C_{24}H_{38}O_4$ / $C_6H_4(COOC_8H_{17})_2$

Molecular mass: 390.6

Boiling point: 385°C

Melting point: -50°C

Relative density (water = 1): 0.986

Solubility in water: none

Vapour pressure, kPa at 20°C: 0.001

Relative vapour density (air = 1): 13.45

Flash point: 215°C o.c.

Auto-ignition temperature: 350°C

Octanol/water partition coefficient as log Pow: 5.03

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract.

Inhalation risk

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.

Effects of long-term or repeated exposure

The substance may have effects on the testes. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITSTLV: 5 mg/m³, as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).MAK: (inhalable fraction): 2 mg/m³; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C**ENVIRONMENT**

Bioaccumulation of this chemical may occur in seafood.

NOTES**ADDITIONAL INFORMATION****EC Classification**

Symbol: T; R: 60-61; S: 53-45

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

DIBENZO(a,h)ANTHRACENE**ICSC: 0431 (November 2016)**


1,2:5,6-Dibenzanthracene

CAS #: 53-70-3**UN #: 3077****EC Number: 200-181-8**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use water spray, powder.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest. Seek medical attention if you feel unwell.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Seek medical attention if you feel unwell.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria  DANGER May cause cancer Very toxic to aquatic life with long lasting effects Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III
STORAGE	
Well closed. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Marine pollutant.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

DIBENZO(a,h)ANTHRACENE**ICSC: 0431****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS CRYSTALLINE POWDER.

Physical dangers**Chemical dangers**Formula: C₂₂H₁₄

Molecular mass: 278.4

Boiling point: 524°C

Melting point: 267°C

Relative density (water = 1): 1.28

Solubility in water: none

Octanol/water partition coefficient as log Pow: 6.5

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

See Notes.

Inhalation risk

A nuisance-causing concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

The substance may have effects on the skin. This may result in photosensitization. This substance is probably carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

MAK: carcinogen category: 2; germ cell mutagen group: 3A; skin absorption (H)

ENVIRONMENT

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. Bioaccumulation of this chemical may occur along the food chain. It is strongly advised not to let the chemical enter into the environment.

NOTES

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 45-50/53; S: 53-45-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1 Identification

Product identifier

Product name: Dibenzofuran

Stock number: A16521, L06756

CAS Number:

132-64-9

EC number:

205-071-3

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Manufacturer/Supplier:

Alfa Aesar

Thermo Fisher Scientific Chemicals, Inc.

30 Bond Street

Ward Hill, MA 01835-8099

Tel: 800-343-0660

Fax: 800-322-4757

Email: tech@alfa.com

www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)

The substance is not classified according to the Globally Harmonized System (GHS).

Hazards not otherwise classified No information known.

Label elements

GHS label elements Not applicable

Hazard pictograms Not applicable

Signal word Not applicable


Hazard statements Not applicable

WHMIS classification Not controlled

Classification system

HMIS ratings (scale 0-4)

(Hazardous Materials Identification System)

HEALTH  Health (acute effects) = 1

FIRE  Flammability = 1

REACTIVITY  Physical Hazard = 1

Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances

CAS# Description:

132-64-9 Dibenzofuran

Identification number(s):

EC number: 205-071-3

4 First-aid measures

Description of first aid measures

After inhalation

Supply fresh air. If required, provide artificial respiration. Keep patient warm.

Seek immediate medical advice.

After skin contact

Immediately wash with water and soap and rinse thoroughly.

Seek immediate medical advice.

After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing Seek medical treatment.

Information for doctor

Most important symptoms and effects, both acute and delayed No further relevant information available.

Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

Special hazards arising from the substance or mixture

If this product is involved in a fire, the following can be released:

Carbon monoxide and carbon dioxide

Advice for firefighters

Protective equipment:

Wear self-contained respirator.

Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Wear protective equipment. Keep unprotected persons away.

Ensure adequate ventilation

Environmental precautions: Do not allow material to be released to the environment without proper governmental permits.

Methods and material for containment and cleaning up: Pick up mechanically.

Prevention of secondary hazards: No special measures required.

Product name: Dibenzofuran

(Contd. of page 1)

Reference to other sections

See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

Handling

Precautions for safe handling

Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities

Storage

Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility: Store away from oxidizing agents.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s): No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:

Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace: Not required.

Additional information: No data

Exposure controls

Personal protective equipment

General protective and hygienic measures

The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Use suitable respirator when high concentrations are present.

Protection of hands:

Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Eye protection: Safety glasses

Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance:

Form: Crystalline powder
Color: White
Odor: Not determined
Odor threshold: Not determined.

pH-value: Not applicable.

Change in condition

Melting point/Melting range: 81-85 °C (178-185 °F)
Boiling point/Boiling range: Not determined
Sublimation temperature / start: Not determined

Flash point: Not applicable
Flammability (solid, gaseous): Not determined.
Ignition temperature: Not determined
Decomposition temperature: Not determined
Auto igniting: Not determined.

Danger of explosion: Product does not present an explosion hazard.

Explosion limits:

Lower: Not determined
Upper: Not determined
Vapor pressure: Not applicable.
Density at 20 °C (68 °F): 1.089 g/cm³ (9.088 lbs/gal)
Relative density: Not determined.
Vapor density: Not applicable.
Evaporation rate: Not applicable.
Solubility in / Miscibility with
Water: Not determined
Partition coefficient (n-octanol/water): Not determined.
Viscosity:
dynamic: Not applicable.
kinematic: Not applicable.
Other information No further relevant information available.

10 Stability and reactivity

Reactivity No information known.

Chemical stability Stable under recommended storage conditions.

Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.

Possibility of hazardous reactions No dangerous reactions known

Conditions to avoid No further relevant information available.

Incompatible materials: Oxidizing agents

(Contd. on page 3)

USA

Product name: **Dibenzofuran**

Hazardous decomposition products: Carbon monoxide and carbon dioxide

(Contd. of page 2)

11 Toxicological information**Information on toxicological effects****Acute toxicity:** No effects known.**LD/LC50 values that are relevant for classification:** No data**Skin irritation or corrosion:** May cause irritation**Eye irritation or corrosion:** May cause irritation**Sensitization:** No sensitizing effects known.**Germ cell mutagenicity:** No effects known.**Carcinogenicity:** No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.**Reproductive toxicity:** No effects known.**Specific target organ system toxicity - repeated exposure:** No effects known.**Specific target organ system toxicity - single exposure:** No effects known.**Aspiration hazard:** No effects known.**Subacute to chronic toxicity:** No effects known.**Additional toxicological information:** To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.**12 Ecological information****Toxicity****Aquatic toxicity:** No further relevant information available.**Persistence and degradability** No further relevant information available.**Bioaccumulative potential** No further relevant information available.**Mobility in soil** No further relevant information available.**Ecotoxical effects:****Remark:** Toxic for aquatic organisms**Additional ecological information:****General notes:**

Do not allow material to be released to the environment without proper governmental permits.

Toxic for aquatic organisms

Do not allow product to reach ground water, water course or sewage system.

Danger to drinking water if even small quantities leak into the ground.

Also poisonous for fish and plankton in water bodies.

Toxic to aquatic life.

May cause long lasting harmful effects to aquatic life.

Avoid transfer into the environment.

Results of PBT and vPvB assessment**PBT:** Not applicable.**vPvB:** Not applicable.**Other adverse effects** No further relevant information available.**13 Disposal considerations****Waste treatment methods****Recommendation** Consult state, local or national regulations to ensure proper disposal.**Uncleaned packagings:****Recommendation:** Disposal must be made according to official regulations.**14 Transport information****UN-Number**

DOT, IMDG, IATA

UN3077

UN proper shipping name

DOT

IMDG, IATA

Environmentally hazardous substances, solid, n.o.s. (Dibenzofuran)

ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Dibenzofuran)

Transport hazard class(es)

DOT, IMDG



Class

Label

Class

Label

IATA

9 Miscellaneous dangerous substances and articles.

9

9 (M7) Miscellaneous dangerous substances and articles

9



Class

Label

9 Miscellaneous dangerous substances and articles.

9

Packing group

DOT, IMDG, IATA

III

Environmental hazards:**Special marking (ADR):**

Symbol (fish and tree)

Special marking (IATA):

Symbol (fish and tree)

Special precautions for user

Warning: Miscellaneous dangerous substances and articles

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable.**Transport/Additional information:**

DOT

Marine Pollutant (DOT):

No

UN "Model Regulation":

UN3077, Environmentally hazardous substances, solid, n.o.s. (Dibenzofuran), 9, III

Product name: Dibenzofuran

(Contd. of page 3)

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture

GHS label elements Not applicable

Hazard pictograms Not applicable

Signal word Not applicable

Hazard statements Not applicable

National regulations

All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).

SARA Section 313 (specific toxic chemical listings)

132-64-9 | Dibenzofuran

California Proposition 65

Prop 65 - Chemicals known to cause cancer Substance is not listed.

Prop 65 - Developmental toxicity Substance is not listed.

Prop 65 - Developmental toxicity, female Substance is not listed.

Prop 65 - Developmental toxicity, male Substance is not listed.

Information about limitation of use:

For use only by technically qualified individuals.

This product is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.

Other regulations, limitations and prohibitive regulations

Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.

Substance is not listed.

Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.

Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department

Date of preparation / last revision 11/23/2015 / -

Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)

IMDG: International Maritime Code for Dangerous Goods

DOT: US Department of Transportation

IATA: International Air Transport Association

EINECS: European Inventory of Existing Commercial Chemical Substances

CAS: Chemical Abstracts Service (division of the American Chemical Society)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

vPvB: very Persistent and very Bioaccumulative

ACGIH: American Conference of Governmental Industrial Hygienists (USA)

OSHA: Occupational Safety and Health Administration (USA)

NTP: National Toxicology Program (USA)

IARC: International Agency for Research on Cancer

EPA: Environmental Protection Agency (USA)

DIBUTYL PHTHALATE**ICSC: 0036 (July 2002)**1,2-Benzenedicarboxylic acid dibutyl ester
Di-n-butyl phthalate**CAS #: 84-74-2****UN #: 3082****EC Number: 201-557-4**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use foam, dry powder, carbon dioxide.

PREVENT GENERATION OF MISTS! AVOID EXPOSURE OF (PREGNANT) WOMEN!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use ventilation.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in vermiculite, sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III
STORAGE	
Separated from strong oxidants.	
PACKAGING	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



DIBUTYL PHTHALATE**ICSC: 0036****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS-TO-YELLOW VISCOUS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Decomposes on burning. This produces toxic and irritating fumes (phthalic anhydride - see ICSC 0315). Reacts with strong oxidants.

Formula: $C_{16}H_{22}O_4$ / $C_6H_4(COOC_4H_9)_2$

Molecular mass: 278.3

Boiling point: 340°C

Melting point: -35°C

Relative density (water = 1): 1.05

Solubility in water, g/100ml at 25°C: 0.001

Vapour pressure, kPa at 20°C: <0.01

Relative vapour density (air = 1): 9.58

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 157°C c.c.

Auto-ignition temperature: 402°C

Explosive limits, vol% in air: 0.5~2.5 (at 235°C)

Octanol/water partition coefficient as log Pow: 4.72

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Effects of short-term exposure**Inhalation risk**

A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 mg/m³, as TWA.

MAK: 0.58 mg/m³, 0.05 ppm; peak limitation category: I(2); carcinogen category: 3; pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES**ADDITIONAL INFORMATION****EC Classification**

Symbol: T, N; R: 61-62-50; S: 53-45-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

DIETHYL PHTHALATE**ICSC: 0258 (March 2001)**1,2-Benzenedicarboxylic acid diethyl ester
DEP**CAS #: 84-66-2****EC Number: 201-550-6**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use alcohol-resistant foam, powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Lethargy.	Use ventilation. Use local exhaust.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes		Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Nausea.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
PACKAGING	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

DIETHYL PHTHALATE**ICSC: 0258****PHYSICAL & CHEMICAL INFORMATION**

Physical State; Appearance
COLOURLESS OILY LIQUID.

Physical dangers**Chemical dangers**

Decomposes on heating and on burning. This produces toxic fumes and gases (phthalic anhydride - see ICSC 0315). Attacks some plastics.

Formula: $C_6H_4(COOC_2H_5)_2$ / $C_{12}H_{14}O_4$

Molecular mass: 222.3

Boiling point: 295°C

Melting point: -67 - -44°C

Relative density (water = 1): 1.1

Solubility in water at 25°C: none

Relative vapour density (air = 1): 7.7

Flash point: 117°C c.c.

Auto-ignition temperature: 457°C

Explosive limits, vol% in air: 0.7-?

Octanol/water partition coefficient as log Pow: 2.47

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure**Inhalation risk**

A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS**

TLV: 5 mg/m³, as TWA; A4 (not classifiable as a human carcinogen)

ENVIRONMENT

This substance may be hazardous to the environment. Special attention should be given to fish.

NOTES**ADDITIONAL INFORMATION****EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

DIMETHYL PHTHALATE**ICSC: 0261 (October 2005)**

Dimethyl 1,2-benzenedicarboxylate
 Phthalic acid dimethyl ester
 1,2-Benzenedicarboxylic acid, dimethyl ester
 DMP

CAS #: 131-11-3**EC Number: 205-011-6**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use water spray, foam, powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use ventilation.	Fresh air, rest.
Skin		Protective gloves.	Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Store in an area without drain or sewer access.	
PACKAGING	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021



DIMETHYL PHTHALATE**ICSC: 0261****PHYSICAL & CHEMICAL INFORMATION**

Physical State; Appearance
COLOURLESS OILY LIQUID.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces irritating fumes.

Formula: $C_6H_4(COOCH_3)_2$ / $C_{10}H_{10}O_4$

Molecular mass: 194.2

Boiling point: 284°C

Melting point: 5.5°C

Relative density (water = 1): 1.19

Solubility in water, g/100ml at 20°C: 0.43

Vapour pressure, Pa at 20°C: 0.8

Relative vapour density (air = 1): 6.69

Flash point: 146°C c.c.

Auto-ignition temperature: 490°C

Explosive limits, vol% in air: 0.9 (at 180°C) - 8.0 (at 109°C)

Octanol/water partition coefficient as log Pow: 1.47/2.12

EXPOSURE & HEALTH EFFECTS**Routes of exposure****Effects of short-term exposure****Inhalation risk**

A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS**

TLV: 5 mg/m³, as TWA

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Other melting points: ≈0°C (commercial product).

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1 Identification

Product identifier

Product name: Di-n-octyl phthalate

Stock number: 41522

CAS Number:

117-84-0

EC number:

204-214-7

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Manufacturer/Supplier:

Alfa Aesar

Thermo Fisher Scientific Chemicals, Inc.

30 Bond Street

Ward Hill, MA 01835-8099

Tel: 800-343-0660

Fax: 800-322-4757

Email: tech@alfa.com

www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)

The substance is not classified according to the Globally Harmonized System (GHS).

Hazards not otherwise classified No information known.

Label elements

GHS label elements Not applicable

Hazard pictograms Not applicable

Signal word Not applicable


Hazard statements Not applicable

WHMIS classification Not controlled


Classification system

HMIS ratings (scale 0-4)

(Hazardous Materials Identification System)

HEALTH  Health (acute effects) = 1

FIRE  Flammability = 1

REACTIVITY  Physical Hazard = 1

Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances

CAS# Description:

117-84-0 Di-n-octyl phthalate

Identification number(s):

EC number: 204-214-7

4 First-aid measures

Description of first aid measures

After inhalation

Supply fresh air. If required, provide artificial respiration. Keep patient warm.

Seek immediate medical advice.

After skin contact

Immediately wash with water and soap and rinse thoroughly.

Seek immediate medical advice.

After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing Seek medical treatment.

Information for doctor

Most important symptoms and effects, both acute and delayed No further relevant information available.

Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

Special hazards arising from the substance or mixture

If this product is involved in a fire, the following can be released:

Carbon monoxide and carbon dioxide

Advice for firefighters

Protective equipment:

Wear self-contained respirator.

Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Wear protective equipment. Keep unprotected persons away.

Ensure adequate ventilation

Environmental precautions: Do not allow product to reach sewage system or any water course.

Methods and material for containment and cleaning up: Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).

Prevention of secondary hazards: No special measures required.

Product name: Di-n-octyl phthalate

(Contd. of page 1)

Reference to other sections

See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

Handling

Precautions for safe handling

Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities

Storage

Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility: Store away from oxidizing agents.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:

Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace:

117-84-0 Di-n-octyl phthalate (100.0%)

EL (Canada) Long-term value: 5 mg/m³

Additional information: No data

Exposure controls

Personal protective equipment

General protective and hygienic measures

The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Use suitable respirator when high concentrations are present.

Recommended filter device for short term use:

Use a respirator with organic vapor/acid gas cartridges as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards such as NIOSH (USA) or CEN (EU).

Protection of hands:

Impervious gloves
Check protective gloves prior to each use for their proper condition.

The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Material of gloves Nitrile rubber, NBR

Penetration time of glove material (in minutes) 480

Glove thickness 0.2 mm

Eye protection: Safety glasses

Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance:

Form: Liquid
Color: Colorless to pale yellow
Odor: Not determined
Odor threshold: Not determined.

pH-value: Not determined.

Change in condition

Melting point/Melting range: -25 °C (-13 °F)
Boiling point/Boiling range: 380 °C (716 °F)
Sublimation temperature / start: Not determined

Flash point: 219 °C (426 °F)
Flammability (solid, gaseous) Not determined.
Ignition temperature: Not determined
Decomposition temperature: Not determined
Auto igniting: Not determined.

Danger of explosion: Not determined.

Explosion limits:

Lower: Not determined
Upper: Not determined
Vapor pressure at 220 °C (428 °F): 5.32 hPa (4 mm Hg)
Density at 20 °C (68 °F): 0.98 g/cm³ (8.178 lbs/gal)
Relative density Not determined.
Vapor density Not determined.
Evaporation rate Not determined.
Solubility in / Miscibility with
Water: Not miscible or difficult to mix
Partition coefficient (n-octanol/water): Not determined.
Viscosity:
dynamic: Not determined.
kinematic: Not determined.
Other information No further relevant information available.

Product name: Di-n-octyl phthalate

(Contd. of page 2)

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions Reacts with strong oxidizing agents
Conditions to avoid No further relevant information available.
Incompatible materials: Oxidizing agents
Hazardous decomposition products: Carbon monoxide and carbon dioxide

11 Toxicological information

Information on toxicological effects
Acute toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.
LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: May cause irritation
Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: No effects known.
Carcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains reproductive data for this substance.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Additional ecological information:
General notes: Avoid transfer into the environment.
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

UN-Number DOT, ADN, IMDG, IATA	Not applicable
UN proper shipping name DOT, ADN, IMDG, IATA	Not applicable
Transport hazard class(es) DOT, ADR, ADN, IMDG, IATA Class	Not applicable
Packing group DOT, IMDG, IATA	Not applicable
Environmental hazards:	Not applicable.
Special precautions for user	Not applicable.
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
Transport/Additional information:	
DOT Hazardous substance: Marine Pollutant (DOT):	5000 lbs, 2270 kg No
UN "Model Regulation":	-

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements Not applicable
Hazard pictograms Not applicable
Signal word Not applicable
Hazard statements Not applicable
National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).
SARA Section 313 (specific toxic chemical listings) Substance is not listed.
California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use: For use only by technically qualified individuals.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

(Contd. on page 4)
USA

Product name: **Di-n-octyl phthalate**

(Contd. of page 3)

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.
Substance is not listed.
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.
Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department

Date of preparation / last revision 11/23/2015 / -

Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)

DOT: US Department of Transportation

EINECS: European Inventory of Existing Commercial Chemical Substances

CAS: Chemical Abstracts Service (division of the American Chemical Society)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

vPvB: very Persistent and very Bioaccumulative

ACGIH: American Conference of Governmental Industrial Hygienists (USA)

OSHA: Occupational Safety and Health Administration (USA)

NTP: National Toxicology Program (USA)

IARC: International Agency for Research on Cancer

EPA: Environmental Protection Agency (USA)

1 Identification

Product identifier

Product name: Fluoranthene

Stock number: A17230

CAS Number:

206-44-0

EC number:

205-912-4

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Manufacturer/Supplier:

Alfa Aesar

Thermo Fisher Scientific Chemicals, Inc.

30 Bond Street

Ward Hill, MA 01835-8099

Tel: 800-343-0660

Fax: 800-322-4757

Email: tech@alfa.com

www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)



GHS06 Skull and crossbones

Acute Tox. 3 H301 Toxic if swallowed.



GHS08 Health hazard

Muta. 2 H341 Suspected of causing genetic defects.

Hazards not otherwise classified No information known.

Label elements

GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)

Hazard pictograms



GHS06 GHS08

Signal word

Danger

Hazard statements

H301 Toxic if swallowed.

H341 Suspected of causing genetic defects.

Precautionary statements

P281 Use personal protective equipment as required.

P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/...

P308+P313 IF exposed or concerned: Get medical advice/attention.

P321 Specific treatment (see on this label).

P405 Store locked up.

P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

WHMIS classification

D1B - Toxic material causing immediate and serious toxic effects

D2B - Toxic material causing other toxic effects



Classification system

HMIS ratings (scale 0-4)

(Hazardous Materials Identification System)

HEALTH 1 Health (acute effects) = 1

FIRE 1 Flammability = 1

REACTIVITY 1 Physical Hazard = 1

Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances

CAS# Description:

206-44-0 Fluoranthene

Identification number(s):

EC number: 205-912-4

4 First-aid measures

Description of first aid measures

After inhalation

Supply fresh air. If required, provide artificial respiration. Keep patient warm.

Seek immediate medical advice.

Product name: Fluoranthene

(Contd. of page 1)

After skin contact

Immediately wash with water and soap and rinse thoroughly.

Seek immediate medical advice.

After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing Seek medical treatment.

Information for doctor

Most important symptoms and effects, both acute and delayed No further relevant information available.

Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

Special hazards arising from the substance or mixture

If this product is involved in a fire, the following can be released:

Carbon monoxide and carbon dioxide

Advice for firefighters

Protective equipment:

Wear self-contained respirator.

Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Wear protective equipment. Keep unprotected persons away.

Ensure adequate ventilation

Environmental precautions: Do not allow material to be released to the environment without proper governmental permits.

Methods and material for containment and cleaning up: Dispose of contaminated material as waste according to section 13.

Prevention of secondary hazards: No special measures required.

Reference to other sections

See Section 7 for information on safe handling

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

7 Handling and storage

Handling

Precautions for safe handling

Keep container tightly sealed.

Store in cool, dry place in tightly closed containers.

Ensure good ventilation at the workplace.

Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities

Storage

Requirements to be met by storerooms and receptacles: No special requirements.

Information about storage in one common storage facility: Store away from oxidizing agents.

Further information about storage conditions:

Keep container tightly sealed.

Store in cool, dry conditions in well sealed containers.

Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:

Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace: Not required.

Additional information: No data

Exposure controls

Personal protective equipment

General protective and hygienic measures

The usual precautionary measures for handling chemicals should be followed.

Keep away from foodstuffs, beverages and feed.

Remove all soiled and contaminated clothing immediately.

Wash hands before breaks and at the end of work.

Maintain an ergonomically appropriate working environment.

Breathing equipment: Use suitable respirator when high concentrations are present.

Protection of hands:

Impervious gloves

Check protective gloves prior to each use for their proper condition.

The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Eye protection: Safety glasses

Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance:

Form: Crystalline

Color: Yellow

Odor: Not determined

Odor threshold: Not determined.

pH-value: Not applicable.

Change in condition

Melting point/Melting range: 107-110 °C (225-230 °F)

Boiling point/Boiling range: Not determined

Sublimation temperature / start: Not determined

Flash point: Not applicable

Flammability (solid, gaseous) Not determined.

Ignition temperature: Not determined

(Contd. on page 3)

Product name: Fluoranthene

(Contd. of page 2)

Decomposition temperature:	Not determined
Auto igniting:	Not determined.
Danger of explosion:	Product does not present an explosion hazard.
Explosion limits:	
Lower:	Not determined
Upper:	Not determined
Vapor pressure:	Not applicable.
Density:	Not determined
Relative density	Not determined.
Vapor density	Not applicable.
Evaporation rate	Not applicable.
Solubility in / Miscibility with	
Water:	Insoluble
Partition coefficient (n-octanol/water):	Not determined.
Viscosity:	
dynamic:	Not applicable.
kinematic:	Not applicable.
Other information	No further relevant information available.

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions No dangerous reactions known
Conditions to avoid No further relevant information available.
Incompatible materials: Oxidizing agents
Hazardous decomposition products: Carbon monoxide and carbon dioxide

11 Toxicological information

Information on toxicological effects
Acute toxicity: Harmful if swallowed.
LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: Irritant to skin and mucous membranes.
Eye irritation or corrosion: Irritating effect.
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: Suspected of causing genetic defects.
Carcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity: No effects known.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Other information (about experimental toxicology):
Tumorigenic effects have been observed on tests with laboratory animals.
Mutagenic effects have been observed on tests with bacteria.
Mutagenic effects have been observed on tests with human lymphocytes.
Mutagenic effects have been observed on tests with laboratory animals.
Subacute to chronic toxicity:
The Registry of Toxic Effects of Chemical Substances (RTECS) reports the following effects in laboratory animals:
Kidney, Ureter, Bladder - changes in tubules (including acute renal failure, acute tubular necrosis).
Blood - normocytic anemia.
Blood - changes in leukocyte (WBC) count.
Skin and Appendages - tumors.
Tumorigenic - equivocal tumorigenic agent by RTECS criteria.
Tumorigenic - tumors at site of application.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Additional ecological information:
General notes:
Do not allow material to be released to the environment without proper governmental permits.
Do not allow undiluted product or large quantities to reach ground water, water course or sewage system.
Avoid transfer into the environment.
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

Not a hazardous material for transportation.

UN-Number DOT, IMDG, IATA	None
UN proper shipping name DOT, IMDG, IATA	None

(Contd. on page 4)
USA

Product name: Fluoranthene

(Contd. of page 3)

Transport hazard class(es)

DOT, ADR, IMDG, IATA
Class

None

Packing group
DOT, IMDG, IATA

None

Environmental hazards:

Not applicable.

Special precautions for user

Not applicable.

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Not applicable.

Transport/Additional information:

Not dangerous according to the above specifications.

DOT
Hazardous substance:
Marine Pollutant (DOT):

100 lbs, 45.4 kg
No

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture

GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)

Hazard pictograms



GHS06 GHS08

Signal word Danger

Hazard statements

H301 Toxic if swallowed.

H341 Suspected of causing genetic defects.

Precautionary statements

P281 Use personal protective equipment as required.

P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/...

P308+P313 IF exposed or concerned: Get medical advice/attention.

P321 Specific treatment (see on this label).

P405 Store locked up.

P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

National regulations

All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.

All components of this product are listed on the Canadian Non-Domestic Substances List (NDSL).

SARA Section 313 (specific toxic chemical listings)

206-44-0 | Fluoranthene

California Proposition 65

Prop 65 - Chemicals known to cause cancer Substance is not listed.

Prop 65 - Developmental toxicity Substance is not listed.

Prop 65 - Developmental toxicity, female Substance is not listed.

Prop 65 - Developmental toxicity, male Substance is not listed.

Information about limitation of use:

For use only by technically qualified individuals.

This product is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.

Other regulations, limitations and prohibitive regulations

Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.

Substance is not listed.

Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.

Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department

Date of preparation / last revision 11/23/2015 / -

Abbreviations and acronyms:

IMDG: International Maritime Code for Dangerous Goods

DOT: US Department of Transportation

IATA: International Air Transport Association

EINECS: European Inventory of Existing Commercial Chemical Substances

CAS: Chemical Abstracts Service (division of the American Chemical Society)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

vPvB: very Persistent and very Bioaccumulative

ACGIH: American Conference of Governmental Industrial Hygienists (USA)

OSHA: Occupational Safety and Health Administration (USA)

NTP: National Toxicology Program (USA)

IARC: International Agency for Research on Cancer

EPA: Environmental Protection Agency (USA)

1 Identification

Product identifier

Product name: **Fluorene**

Stock number: A13871

CAS Number:

86-73-7

EC number:

201-695-5

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Manufacturer/Supplier:

Alfa Aesar

Thermo Fisher Scientific Chemicals, Inc.

30 Bond Street

Ward Hill, MA 01835-8099

Tel: 800-343-0660

Fax: 800-322-4757

Email: tech@alfa.com

www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)

The substance is not classified according to the Globally Harmonized System (GHS).

Hazards not otherwise classified No information known.

Label elements

GHS label elements Not applicable

Hazard pictograms Not applicable

Signal word Not applicable


Hazard statements Not applicable

WHMIS classification Not controlled

Classification system

HMIS ratings (scale 0-4)

(Hazardous Materials Identification System)

HEALTH  Health (acute effects) = 1

FIRE  Flammability = 1

REACTIVITY  Physical Hazard = 1

Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances

CAS# Description:

86-73-7 Fluorene

Identification number(s):

EC number: 201-695-5

4 First-aid measures

Description of first aid measures

After inhalation

Supply fresh air. If required, provide artificial respiration. Keep patient warm.

Seek immediate medical advice.

After skin contact

Immediately wash with water and soap and rinse thoroughly.

Seek immediate medical advice.

After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing Seek medical treatment.

Information for doctor

Most important symptoms and effects, both acute and delayed No further relevant information available.

Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

Special hazards arising from the substance or mixture

If this product is involved in a fire, the following can be released:

Carbon monoxide and carbon dioxide

Advice for firefighters

Protective equipment:

Wear self-contained respirator.

Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Wear protective equipment. Keep unprotected persons away.

Ensure adequate ventilation

Environmental precautions: Do not allow material to be released to the environment without proper governmental permits.

Methods and material for containment and cleaning up: Pick up mechanically.

Prevention of secondary hazards: No special measures required.

Product name: Fluorene

(Contd. of page 1)

Reference to other sections

See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

Handling

Precautions for safe handling

Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities

Storage

Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility: Store away from oxidizing agents.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:

Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace: Not required.

Additional information: No data

Exposure controls

Personal protective equipment

General protective and hygienic measures

The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Use suitable respirator when high concentrations are present.

Protection of hands:

Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Penetration time of glove material (in minutes) Not determined

Eye protection: Safety glasses

Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance:

Form: Powder
Color: White
Odor: Not determined
Odor threshold: Not determined.

pH-value: Not applicable.

Change in condition

Melting point/Melting range: 112-115 °C (234-239 °F)
Boiling point/Boiling range: 295 °C (563 °F)
Sublimation temperature / start: Not determined

Flash point: 151 °C (304 °F)
Flammability (solid, gaseous) Not determined.
Ignition temperature: Not determined
Decomposition temperature: Not determined
Auto igniting: Not determined.

Danger of explosion: Product does not present an explosion hazard.

Explosion limits:

Lower: Not determined
Upper: Not determined
Vapor pressure: Not applicable.
Density at 20 °C (68 °F): 1.202 g/cm³ (10.031 lbs/gal)
Relative density Not determined.
Vapor density Not applicable.
Evaporation rate Not applicable.
Solubility in / Miscibility with
Water: Insoluble
Partition coefficient (n-octanol/water): Not determined.
Viscosity:
dynamic: Not applicable.
kinematic: Not applicable.
Other information No further relevant information available.

10 Stability and reactivity

Reactivity No information known.

Chemical stability Stable under recommended storage conditions.

Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.

Possibility of hazardous reactions No dangerous reactions known

Conditions to avoid No further relevant information available.

Incompatible materials: Oxidizing agents

(Contd. on page 3)
USA

Product name: **Fluorene**

Hazardous decomposition products: Carbon monoxide and carbon dioxide

(Contd. of page 2)

11 Toxicological information**Information on toxicological effects****Acute toxicity:** No effects known.**LD/LC50 values that are relevant for classification:** No data**Skin irritation or corrosion:** Irritant to skin and mucous membranes.**Eye irritation or corrosion:** Irritating effect.**Sensitization:** No sensitizing effects known.**Germ cell mutagenicity:** No effects known.**Carcinogenicity:** No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.**Reproductive toxicity:** No effects known.**Specific target organ system toxicity - repeated exposure:** No effects known.**Specific target organ system toxicity - single exposure:** No effects known.**Aspiration hazard:** No effects known.**Subacute to chronic toxicity:** No effects known.**Additional toxicological information:** To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.**12 Ecological information****Toxicity****Aquatic toxicity:** No further relevant information available.**Persistence and degradability** No further relevant information available.**Bioaccumulative potential** No further relevant information available.**Mobility in soil** No further relevant information available.**Ecotoxical effects:****Remark:** Very toxic for aquatic organisms**Additional ecological information:****General notes:**

Do not allow product to reach ground water, water course or sewage system.

Do not allow material to be released to the environment without proper governmental permits.

Danger to drinking water if even small quantities leak into the ground.

Also poisonous for fish and plankton in water bodies.

May cause long lasting harmful effects to aquatic life.

Avoid transfer into the environment.

Very toxic for aquatic organisms

Results of PBT and vPvB assessment**PBT:** Not applicable.**vPvB:** Not applicable.**Other adverse effects** No further relevant information available.**13 Disposal considerations****Waste treatment methods****Recommendation** Consult state, local or national regulations to ensure proper disposal.**Uncleaned packagings:****Recommendation:** Disposal must be made according to official regulations.**14 Transport information****UN-Number**

DOT, IMDG, IATA

UN3077

UN proper shipping name

DOT

IMDG, IATA

Environmentally hazardous substances, solid, n.o.s. (Fluorene)

ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Fluorene)

Transport hazard class(es)

DOT, IMDG



Class

Label

Class

Label

IATA

9 Miscellaneous dangerous substances and articles.

9

9 (M7) Miscellaneous dangerous substances and articles

9



Class

Label

9 Miscellaneous dangerous substances and articles.

9

Packing group

DOT, IMDG, IATA

III

Environmental hazards:**Special marking (ADR):****Special marking (IATA):**

Symbol (fish and tree)

Symbol (fish and tree)

Special precautions for user

Warning: Miscellaneous dangerous substances and articles

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable.**Transport/Additional information:**

DOT

Marine Pollutant (DOT):

No

UN "Model Regulation":

UN3077, Environmentally hazardous substances, solid, n.o.s. (Fluorene), 9, III

Product name: Fluorene

(Contd. of page 3)

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture

GHS label elements Not applicable

Hazard pictograms Not applicable

Signal word Not applicable

Hazard statements Not applicable

National regulations

All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).

SARA Section 313 (specific toxic chemical listings) Substance is not listed.

California Proposition 65

Prop 65 - Chemicals known to cause cancer Substance is not listed.

Prop 65 - Developmental toxicity Substance is not listed.

Prop 65 - Developmental toxicity, female Substance is not listed.

Prop 65 - Developmental toxicity, male Substance is not listed.

Information about limitation of use:

For use only by technically qualified individuals.

This product is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.

Other regulations, limitations and prohibitive regulations

Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.

Substance is not listed.

Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.

Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department

Date of preparation / last revision 11/23/2015 / -

Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)

IMDG: International Maritime Code for Dangerous Goods

DOT: US Department of Transportation

IATA: International Air Transport Association

EINECS: European Inventory of Existing Commercial Chemical Substances

CAS: Chemical Abstracts Service (division of the American Chemical Society)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

vPvB: very Persistent and very Bioaccumulative

ACGIH: American Conference of Governmental Industrial Hygienists (USA)

OSHA: Occupational Safety and Health Administration (USA)

NTP: National Toxicology Program (USA)

IARC: International Agency for Research on Cancer

EPA: Environmental Protection Agency (USA)

HEXACHLOROBUTADIENE**ICSC: 0896 (August 1997)**1,1,2,3,4,4-Hexachloro-1,3-butadiene
Perchlorobutadiene**CAS #: 87-68-3****UN #: 2279****EC Number: 201-765-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Burning sensation. Cough. Sore throat. Symptoms may be delayed. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Pain. Redness. Blisters. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
Eyes	Pain. Redness. Severe deep burns. Loss of vision.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Separated from food and feedstuffs. Well closed. Ventilation along the floor. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Do not transport with food and feedstuffs. Severe marine pollutant.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

HEXACHLOROBUTADIENE

ICSC: 0896

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Attacks rubber and some forms of plastic.

Formula: C_4Cl_6 / $CCl_2=CCICCl=CCl_2$

Molecular mass: 260.8

Boiling point: 212°C

Melting point: -18°C

Relative density (water = 1): 1.68

Solubility in water: none

Vapour pressure, Pa at 20°C: 20

Relative vapour density (air = 1): 9.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 90°C

Auto-ignition temperature: 610°C

Octanol/water partition coefficient as log Pow: 4.90

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The liquid is corrosive. The substance may cause effects on the kidneys.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. May cause genetic damage in humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.02 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 0.22 mg/m³, 0.02 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. The substance may cause long-term effects in the aquatic environment.

NOTES

ADDITIONAL INFORMATION

EC Classification

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

HEXACHLOROCYCLOPENTADIENE**ICSC: 1096 (October 2005)**1,2,3,4,5,5-Hexachloro-1,3-cyclopentadiene
Perchlorocyclopentadiene**CAS #: 77-47-4****UN #: 2646****EC Number: 201-029-3**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Headache. Diarrhoea. Dizziness. Nausea. Vomiting. Laboured breathing.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain. Blurred vision. Severe deep burns.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Burning sensation. Shock or collapse. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable plastic containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: I
STORAGE	
Store in an area without drain or sewer access. Dry. Well closed. Ventilation along the floor.	
PACKAGING	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

HEXACHLOROCYCLOPENTADIENE

ICSC: 1096

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

OILY YELLOW-TO-GREEN LIQUID WITH PUNGENT ODOUR.

Physical dangers

The vapour is heavier than air.

Chemical dangers

Decomposes on heating. This produces toxic and corrosive fumes including hydrogen chloride and phosgene. Reacts with moist air. This produces hydrogen chloride (see ICSC 0163). Attacks many metals in the presence of water. This produces flammable/explosive gas (hydrogen - see ICSC 0001).

Formula: C₅Cl₆

Molecular mass: 272.7

Boiling point: 239°C

Melting point: -9°C

Relative density (water = 1): 1.7

Solubility in water, g/100ml at 25°C: 0.2

Vapour pressure, Pa at 20°C: 10.7

Relative vapour density (air = 1): 9.4

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Octanol/water partition coefficient as log Pow: 4/5

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation may cause lung oedema. See Notes. The substance may cause effects on the kidneys and liver. This may result in tissue lesions. The effects may be delayed. Medical observation is indicated.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.01 ppm as TWA; A4 (not classifiable as a human carcinogen).

MAK skin absorption (H)

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. The substance may cause long-term effects in the aquatic environment.

NOTES

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort.

Rest and medical observation are therefore essential.

Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered.

ADDITIONAL INFORMATION

EC Classification

Symbol: T+, N; R: 22-24-26-34-50/53; S: (1/2)-25-39-45-53-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.


HEXACHLOROETHANE**ICSC: 0051 (November 2010)**

Perchloroethane
Carbon hexachloride

CAS #: 67-72-1**UN #: 3077;(NOS)****EC Number: 200-666-4**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST! PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety goggles.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>Harmful if swallowed May cause drowsiness or dizziness Causes damage to the central nervous system, the kidneys and the liver through prolonged or repeated exposure Very toxic to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III</p>
STORAGE	
Separated from strong oxidants, alkali metals and food and feedstuffs. See Chemical Dangers. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

HEXACHLOROETHANE

ICSC: 0051

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Decomposes above 300°C . This produces toxic and corrosive fumes of phosgene (see ICSC 0007) and hydrogen chloride (see ICSC 0163).
 Reacts with zinc, aluminium powder and sodium. Reacts violently with alkali metals and strong oxidants.

Formula: C₂Cl₆ / Cl₃CCCl₃

Molecular mass: 236.7

Sublimation point: 183-185°C

Relative density (water = 1): 2.1

Solubility in water: none

Vapour pressure, Pa at 20°C: 53

Relative vapour density (air = 1): 8.2

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0

Octanol/water partition coefficient as log Pow: 3.9

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by ingestion.

Effects of short-term exposure

The vapour is irritating to the eyes.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

The substance may have effects on the liver and kidneys. The substance may have effects on the central nervous system. This may result in ataxia and tremors. Tumours have been detected in experimental animals but may not be relevant to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 9.8 mg/m³, 1 ppm; skin absorption (H); peak limitation category: II(2); pregnancy risk group: C; carcinogen category: 3

ENVIRONMENT

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Use of alcoholic beverages enhances the harmful effect.

The odour warning when the exposure limit value is exceeded is insufficient.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION

EC Classification

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

HEXACHLOROBENZENE**ICSC: 0895 (March 1999)**

Perchlorobenzene
 HCB
 Pentachlorophenylchloride
 Phenyl perchloryl

CAS #: 118-74-1**UN #: 2729****EC Number: 204-273-9**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use water spray, foam, powder, carbon dioxide.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit and particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into sealable containers. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Separated from food and feedstuffs. Well closed.	
PACKAGING	
Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021



European
Commission

HEXACHLOROBENZENE

ICSC: 0895

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-WHITE SOLID IN VARIOUS FORMS.

Physical dangers**Chemical dangers**

Decomposes on heating. This produces toxic fumes.

Formula: C₆Cl₆

Molecular mass: 284.8

Boiling point: 323-326°C

Melting point: 231°C

Density: 1.21 g/cm³

Solubility in water, g/100ml at 20°C: 0.0000005

Vapour pressure, Pa at 20°C: 0.001

Relative vapour density (air = 1): 9.8

Flash point: 242°C c.c.

Octanol/water partition coefficient as log Pow: 5.5/6.2

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Effects of short-term exposure**Inhalation risk**

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.

Effects of long-term or repeated exposure

The substance may have effects on the liver and nervous system. This may result in impaired functions of organs and skin lesions. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.002 mg/m³, as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: skin absorption (H); carcinogen category: 4; pregnancy risk group: D

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in plants and fish. The substance may cause long-term effects in the aquatic environment. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification

Symbol: T, N; R: 45-48/25-50/53; S: 53-45-60-61; Note: E

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

INDENO(1,2,3-cd)PYRENE**ICSC: 0730 (March 1999)**o-Phenylenepyrene
2,3-Phenylenepyrene**CAS #: 193-39-5****EC Number: 205-893-2**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION			In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Provision to contain effluent from fire extinguishing. Well closed.	
PACKAGING	



World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European Commission

INDENO(1,2,3-cd)PYRENE**ICSC: 0730****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

YELLOW CRYSTALS.

Physical dangers**Chemical dangers**

Upon heating, toxic fumes are formed. Decomposes on heating. This produces toxic fumes.

Formula: C₂₂H₁₂

Molecular mass: 276.3

Boiling point: 536°C

Melting point: 164°C

Solubility in water: none

Octanol/water partition coefficient as log Pow: 6.58

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

Effects of short-term exposure**Inhalation risk**

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure

This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

MAK: skin absorption (H); carcinogen category: 2

ENVIRONMENT

This substance may be hazardous to the environment. Special attention should be given to air quality and water quality.

Bioaccumulation of this chemical may occur in fish.

NOTES

Indeno(1,2,3-cd)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.

ACGIH recommends environment containing Indeno(1,2,3-c,d)pyrene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m³.

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

ISOPHORONE**ICSC: 0169 (October 2000)**

1,1,3-Trimethyl-3-cyclohexene-5-one
 3,5,5-Trimethylcyclohex-2-enone
 Isoacetophorone

CAS #: 78-59-1**EC Number: 201-126-0**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Above 84°C explosive vapour/air mixtures may be formed.	NO open flames. Above 84°C use a closed system and ventilation.	Use water spray, powder, foam, carbon dioxide.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Burning sensation. Sore throat. Cough. Dizziness. Headache. Nausea. Shortness of breath.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain. Blurred vision.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Separated from strong oxidants, strong bases and amines.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021



European
Commission

ISOPHORONE**ICSC: 0169****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Reacts with strong oxidants, strong bases and amines.

Formula: C₉H₁₄O

Molecular mass: 138.2

Boiling point: 215°C

Melting point: -8°C

Relative density (water = 1): 0.92

Solubility in water, g/100ml at 25°C: 1.2

Vapour pressure, Pa at 20°C: 40

Relative vapour density (air = 1): 4.8

Flash point: 84°C c.c.

Auto-ignition temperature: 460°C

Explosive limits, vol% in air: 0.8-3.8

Octanol/water partition coefficient as log Pow: 1.67

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance and the vapour are irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS**

TLV: 5 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 11 mg/m³, 2 ppm; peak limitation category: I(2); carcinogen category: 3; pregnancy risk group: C**ENVIRONMENT****NOTES**

The occupational exposure limit value should not be exceeded during any part of the working exposure.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn; R: 21/22-36/37-40; S: (2)-13-23-36/37/39-46

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

NAPHTHALENE


ICSC: 0667 (June 2015)

Naphthene

CAS #: 91-20-3**UN #: 1334 (solid) UN #: 2304 (molten)****EC Number: 202-049-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Above 80°C explosive vapour/air mixtures may be formed. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Headache. Weakness. Sweating. Nausea. Vomiting. Further see Ingestion.	Use ventilation (not if powder), local exhaust or breathing protection.	Fresh air. Refer for medical attention.
Skin	See Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Seek medical attention if you feel unwell.
Eyes	Redness.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Abdominal pain. Diarrhoea. Sweating. Headache. Fever. Jaundice. Weakness. Dark-coloured urine. Symptoms may be delayed.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p>  <p>WARNING</p> <p>Flammable solid Harmful if swallowed May be harmful in contact with skin Suspected of causing cancer Very toxic to aquatic life with long lasting effects</p>
STORAGE	
Separated from strong oxidants and food and feedstuffs. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	<p>Transportation UN Classification UN Hazard Class: 4.1; UN Pack Group: III</p>



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

NAPHTHALENE

ICSC: 0667

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

WHITE SOLID IN VARIOUS FORMS WITH CHARACTERISTIC ODOUR.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

On combustion, forms irritating and toxic gases. Reacts with strong oxidants. This generates fire and explosion hazard.

Formula: C₁₀H₈

Molecular mass: 128.18

Boiling point: 218°C

Sublimes at room temperature

Melting point: 80°C

Density: 1.16 g/cm³

Solubility in water at 20°C: very poor

Vapour pressure, Pa at 25°C: 11

Relative vapour density (air = 1): 4.42

Flash point: 80°C c.c.

Auto-ignition temperature: 540°C

Explosive limits, vol% in air: 0.9-5.9

Octanol/water partition coefficient as log Pow: 3.35

EXPOSURE & HEALTH EFFECTS

Routes of exposure

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance may cause effects on the blood. This may result in lesions of blood cells (haemolysis). See Notes. The effects may be delayed. Ingestion could cause death. Medical observation is indicated.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance may have effects on the blood. This may result in chronic haemolytic anaemia. The substance may have effects on the eyes. This may result in development of cataract. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

EU-OEL: 50 mg/m³, 10 ppm as TWA.

MAK: skin absorption (H); carcinogen category: 2; germ cell mutagen group: 3B

ENVIRONMENT

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. Bioaccumulation of this chemical may occur along the food chain, for example in fish.

NOTES

ADDITIONAL INFORMATION

EC Classification

Symbol: Xn, N; R: 22-40-50/53; S: (1/2)-26-36/37/39-45-46-60-61


All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

NITROBENZENE**ICSC: 0065 (April 2006)****CAS #: 98-95-3****UN #: 1662****EC Number: 202-716-0**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 88°C explosive vapour/air mixtures may be formed. Risk of fire and explosion. See Chemical Dangers.	NO open flames. Above 88°C use a closed system and ventilation.	Use water spray, alcohol-resistant foam, dry powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Headache. Blue lips, fingernails and skin. Blue lips, fingernails and skin. Dizziness. Nausea. Weakness. Confusion. Convulsions. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Rest. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>Harmful if swallowed Toxic in contact with skin or if inhaled Suspected of causing cancer Suspected of damaging fertility or the unborn child May cause damage to blood cells Harmful to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II</p>
STORAGE	
Separated from combustible substances, reducing agents, strong oxidants, strong acids and food and feedstuffs. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021



NITROBENZENE**ICSC: 0065****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

PALE YELLOW OILY LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

On combustion, forms toxic and corrosive fumes including nitrogen oxides. Reacts violently with strong oxidants and reducing agents. This generates fire and explosion hazard. Reacts violently with strong acids and nitrogen oxides. This generates explosion hazard.

Formula: $C_6H_5NO_2$

Molecular mass: 123.1

Boiling point: 211°C

Melting point: 5°C

Relative density (water = 1): 1.2

Solubility in water, g/100ml: 0.2

Vapour pressure, Pa at 20°C: 20

Relative vapour density (air = 1): 4.2

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 88°C c.c.

Auto-ignition temperature: 480°C

Explosive limits, vol% in air: 1.8-40

Octanol/water partition coefficient as log Pow: 1.86

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance may cause effects on the blood. This may result in the formation of methaemoglobin. Exposure could cause lowering of consciousness. The effects may be delayed. Medical observation is indicated.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure

The substance may have effects on the blood, spleen and liver. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 0.51 mg/m³, 0.1 ppm; peak limitation category: II(4); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.

EU-OEL: 1 mg/m³, 0.2 ppm as TWA; (skin)

ENVIRONMENT

The substance is harmful to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Use of alcoholic beverages enhances the harmful effect.

Depending on the degree of exposure, periodic medical examination is suggested.

Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.

Do NOT take working clothes home.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 23/24/25-40-48/23/24-51/53-62; S: (1/2)-28-36/37-45-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

N-NITROSODIMETHYLAMINE**ICSC: 0525 (March 2001)**

Dimethylnitrosamine
N-Methyl-N-nitrosomethylamine
DMN

CAS #: 62-75-9**UN #: 2810****EC Number: 200-549-8**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use powder, carbon dioxide.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Nausea. Diarrhoea. Vomiting. Headache. Weakness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Pain. Redness.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal cramps. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Give a slurry of activated charcoal in water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Personal protection: chemical protection suit including self-contained breathing apparatus. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: I
STORAGE	
Separated from strong oxidants and food and feedstuffs. Cool. Keep in the dark. Well closed.	
PACKAGING	
Do not transport with food and feedstuffs. Unbreakable packaging. Put breakable packaging into closed unbreakable container.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

N-NITROSODIMETHYLAMINE**ICSC: 0525****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

YELLOW OILY LIQUID.

Physical dangers**Chemical dangers**

Decomposes on heating. This produces nitrogen oxides. Reacts with strong oxidants and strong bases.

Formula: $C_2H_6N_2O$ / $(CH_3)_2NN=O$

Molecular mass: 74.1

Boiling point: 151°C

Relative density (water = 1): 1.0

Solubility in water: very good

Vapour pressure, Pa at 20°C: 360

Relative vapour density (air = 1): 2.56

Flash point: 61°C

Octanol/water partition coefficient as log Pow: -0.57

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the liver. This may result in jaundice. The effects may be delayed. See Notes. Medical observation is indicated.

Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

The substance may have effects on the liver. This may result in liver function impairment and cirrhosis. This substance is probably carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: skin absorption (H); carcinogen category: 2

ENVIRONMENT

Environmental effects from the substance have not been investigated adequately.

NOTES

The symptoms of jaundice do not become manifest until some hours have passed.

TLV Note: Exposure by all routes should be carefully controlled to levels as low as possible.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T+, N; R: 45-25-26-48/25-51/53; S: 53-45-61; Note: E

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.



TCI AMERICA

SAFETY DATA SHEET

Revision number: 3
Revision date: 10/17/2016

1. IDENTIFICATION

Product name: N-Nitrosodipropylamine
Product code: N0444

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborside Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Acute Toxicity - Oral [Category 4]
Germ Cell Mutagenicity [Category 2]
Carcinogenicity [Category 2]
Toxic to Reproduction [Category 2]
Specific Target Organ Toxicity (Single Exposure) [Category 2]
Aquatic Hazard (Acute) [Category 2]
Aquatic Hazard (Long-Term) [Category 2]

Signal word: Warning!

Hazard Statement(s):
Harmful if swallowed
Suspected of causing cancer
Suspected of causing genetic defects
Suspected of damaging fertility or the unborn child
Toxic to aquatic life
Toxic to aquatic life with long lasting effects
May cause damage to organs: Liver

Pictogram(s) or Symbol(s):



Precautionary Statement(s):
[Prevention]

Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves, protective clothing, eye protection and face protection. Do not breathe fume, mist, vapors or spray. Wash all exposed skin thoroughly after handling.

[Response]

If swallowed: Immediately call a poison center or doctor. Rinse mouth. If exposed: Call a poison center or doctor. If exposed or concerned: Get medical advice or attention. If exposed or concerned: Call a poison center or doctor.

[Storage]

Store locked up.

[Disposal]

Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

2. HAZARD(S) IDENTIFICATION**3. COMPOSITION/INFORMATION ON INGREDIENTS**

Substance/Mixture:	Substance
Components:	N-Nitrosodipropylamine
Percent:	>98.0%(GC)
CAS Number:	621-64-7
Molecular Weight:	130.19
Chemical Formula:	C ₆ H ₁₄ N ₂ O
Synonyms:	DipropylNitrosamine

4. FIRST-AID MEASURES

Inhalation:	Call emergency medical service. Effects of exposure (inhalation) to substance may be delayed. Inhalation of vapors or contact with substance will result in contamination and potential harmful effects. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Skin contact:	Call a poison center or doctor if you feel unwell. Effects of exposure (skin contact) to substance may be delayed. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Eye contact:	If this chemical contacts the eyes, immediately wash (irrigate) the eyes with large amounts of water, occasionally lifting the lower and upper eyelids. If eye irritation persists get medical advice/attention. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Ingestion:	Harmful if swallowed. Effects of exposure (ingestion) to substance may be delayed. If swallowed, seek medical advice immediately and show the container or label. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Symptoms/effects:	
Acute:	No data available
Delayed:	May cause heritable genetic damage in humans. Possibly carcinogenic to humans.
Immediate medical attention:	WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is harmful. CAUTION: Victim may be a source of contamination. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media:	Dry chemical, CO ₂ , water spray, or alcohol-resistant foam. Consult with local fire authorities before attempting large scale fire fighting operations.
--------------------------------------	---

Specific hazards arising from the chemical

Hazardous combustion products:	These products include: Carbon oxides Nitrogen oxides
Other specific hazards:	Closed containers may explode from heat of a fire.

Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
Personal protective equipment:	Splash goggles. Wear protective clothing (chemical resistant suit and chemical resistant boots). Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).
Emergency procedures:	Do not clean-up or dispose except under supervision of a specialist. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and exercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material. Ventilate the area.

Environmental precautions:

Keep away from living quarters. Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling:	Do NOT breath gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Do not ingest. Avoid contact with skin and eyes. Avoid contact - obtain special instructions before use. Avoid prolonged or repeated exposure. Normal measures for preventive fire protection. Avoid exposure - obtain special instructions before use. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.
Conditions for safe storage:	Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.
Storage incompatibilities:	Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits:	No data available
-------------------------	-------------------

Appropriate engineering controls:

Handle only in a fully enclosed system and equipment. Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection:	Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection:	Wear protective gloves.
Eye protection:	Splash goggles.
Skin and body protection:	Wear protective clothing (chemical resistant suit and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C):	Liquid
Form:	Clear
Color:	Pale yellow - Yellow
Odor:	No data available
Odor threshold:	No data available

Melting point/freezing point:	No data available
Boiling point/range:	113°C (235°F)/5.3kPa
Decomposition temperature:	No data available
Relative density:	0.92
Kinematic Viscosity:	No data available
Partition coefficient: n-octanol/water (log P_{ow})	1.36

pH:	No data available
Vapor pressure:	0.01kPa/20°C
Vapor density:	No data available
Dynamic Viscosity:	No data available
Evaporation rate: (Butyl Acetate = 1)	No data available

9. PHYSICAL AND CHEMICAL PROPERTIES

Flash point:	100°C (212°F)	Autoignition temperature:	No data available
Flammability (solid, gas):	No data available	Flammability or explosive limits:	
		Lower:	No data available
		Upper:	No data available
Solubility(ies):			
Water:	Soluble		
Soluble:	Many organic solvents		

10. STABILITY AND REACTIVITY

Reactivity:	Not Available.
Chemical Stability:	Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions:	No hazardous reactivity has been reported.
Conditions to avoid:	Avoid excessive heat and light.
Incompatible materials:	Oxidizing agents
Hazardous Decomposition Products:	No data available

11. TOXICOLOGICAL INFORMATION**RTECS Number:** JL9700000**Acute Toxicity:**

orl-rat LD50:480 mg/kg

scu-rat LD50:487 mg/kg

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

dnd-hmn-kdy 10 mmol/L

dns-hmn-hla 100 umol/L

dns-hmn-lvr 1800 umol/L

Carcinogenicity:

orl-rat TDLo:660 mg/kg/60W-I

scu-ham TD:143 mg/kg/38W-I

IARC: Group 2B (Possibly carcinogenic to humans) .**NTP:** b (Reasonably anticipated to be carcinogens).**OSHA:** No data available**Reproductive toxicity:**

No data available

Routes of Exposure:

Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Overexposure may result in serious illness or death.

Potential Health Effects:

No specific information available; skin and eye contact may result in irritation. May be harmful if inhaled or ingested.

Target organ(s):

May cause damage to organs: Liver

12. ECOLOGICAL INFORMATION**Ecotoxicity**

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

12. ECOLOGICAL INFORMATION

Persistence and degradability:	No data available
Bioaccumulative potential (BCF):	6
Mobility in soil:	No data available
Partition coefficient: n-octanol/water (log P _{ow})	1.36
Soil adsorption (K _{oc}):	130
Henry's Law: constant (PaM ³ /mol)	0.5

13. DISPOSAL CONSIDERATIONS

Disposal of product:	Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container:	Dispose of as unused product. Do not re-use empty containers.
Other considerations:	Observe all federal, state and local regulations when disposing of the substance.

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

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3082	Environmentally hazardous substance, liquid, 9 n.o.s.	Miscellaneous hazardous material	III

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3082	Environmentally hazardous substance, liquid, 9 n.o.s.	Miscellaneous hazardous material	III

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3082	Environmentally hazardous substance, liquid, 9 n.o.s.	Miscellaneous hazardous material	III

EmS number: F-A, S-F

15. REGULATORY INFORMATION**Toxic Substance Control Act (TSCA 8b.):**

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations**CERCLA Hazardous substance and Reportable Quantity:**

SARA 313:	Listed
SARA 302:	Not Listed

State Regulations**State Right-to-Know**

Massachusetts	Listed
New Jersey	Not Listed
Pennsylvania	Listed
California Proposition 65:	Listed

Other Information**NFPA Rating:**

Health:	2
Flammability:	1
Instability:	0

HMIS Classification:

Health:	2
Flammability:	1
Physical:	0

15. REGULATORY INFORMATION**International Inventories****WHMIS hazard class:**

D2A: Materials causing other toxic effects. (Very Toxic)

D2B: Materials causing other toxic effects. (Toxic)

EC-No:

210-698-0

16. OTHER INFORMATION**Revision date:** 10/17/2016**Revision number:** 3

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

N-NITROSODIPHENYLAMINE**ICSC: 0526 (November 2003)**

Diphenylnitrosamine
 N-Nitroso-N-phenyl benzenamine
 N-nitroso-N-phenylaniline
 Nitrous diphenylamide

CAS #: 86-30-6**EC Number: 201-663-0**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use foam, powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Separated from strong oxidants. Store in an area without drain or sewer access.	
PACKAGING	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021



European
Commission

N-NITROSODIPHENYLAMINE**ICSC: 0526****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

YELLOW FLAKES.

Physical dangers**Chemical dangers**

Decomposes on burning. This produces nitrogen oxides. Reacts vigorously with oxidants.

Formula: C₁₂H₁₀N₂O

Molecular mass: 198.2

Boiling point: 101°C

Melting point: 66.5°C

Density: 1.23 g/cm³

Solubility in water: none

Octanol/water partition coefficient as log Pow: 2.57/3.13

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by ingestion.

Effects of short-term exposure**Inhalation risk**

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS**

MAK: carcinogen category: 3

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. It is strongly advised not to let the chemical enter into the environment.

NOTES

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

PENTACHLOROPHENOL**ICSC: 0069 (August 2003)****CAS #: 87-86-5****UN #: 3155****EC Number: 201-778-6**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Liquid formulations containing organic solvents may be flammable.		In case of fire in the surroundings, use appropriate extinguishing media.

PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Dizziness. Drowsiness. Headache. Fever. Laboured breathing. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Blisters. Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention . Wear protective gloves when administering first aid.
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal cramps. Diarrhoea. Nausea. Unconsciousness. Vomiting. Weakness. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit and filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II
STORAGE	
Provision to contain effluent from fire extinguishing. Separated from strong oxidants and food and feedstuffs. Keep in a well-ventilated room.	
PACKAGING	
Do not transport with food and feedstuffs. Severe marine pollutant.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

© ILO and WHO 2021



European
Commission

PENTACHLOROPHENOL**ICSC: 0069****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

WHITE CRYSTALS OR SOLID IN VARIOUS FORMS WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

Decomposes above 200°C. This produces toxic and corrosive fumes including dioxins. Reacts violently with strong oxidants.

Formula: C₆Cl₅OH

Molecular mass: 266.4

Decomposes at 309°C

Melting point: 191°C

Density: 1.98 g/cm³

Solubility in water, g/100ml at 20°C: 0.001

Vapour pressure, Pa at 20°C: 0.02

Relative vapour density (air = 1): 9.2

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Octanol/water partition coefficient as log Pow: 5.01

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the cardiovascular system. This may result in cardiac disorders and heart failure.

Inhalation risk

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Effects of long-term or repeated exposure

The substance may have effects on the central nervous system, kidneys, liver, lungs, immune system and thyroid. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.5 mg/m³, as TWA; 1 mg/m³ as STEL; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued. MAK: skin absorption (H); carcinogen category: 2

ENVIRONMENT

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

The commercial product may contain very toxic impurities (dioxins).
The odour warning when the exposure limit value is exceeded is insufficient.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T+, N; R: 24/25-26-36/37/38-40-50/53; S: (1/2)-22-36/37-45-52-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1 Identification

Product identifier

Product name: Phenanthrene

Stock number: L01921

CAS Number:

85-01-8

EC number:

201-581-5

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Manufacturer/Supplier:

Alfa Aesar

Thermo Fisher Scientific Chemicals, Inc.

30 Bond Street

Ward Hill, MA 01835-8099

Tel: 800-343-0660

Fax: 800-322-4757

Email: tech@alfa.com

www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)



GHS07

Acute Tox. 4 H302 Harmful if swallowed.

Hazards not otherwise classified No information known.

Label elements

GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)

Hazard pictograms



GHS07

Signal word

Warning

Hazard statements

H302 Harmful if swallowed.

Precautionary statements

P264 Wash thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.

P301+P312 IF SWALLOWED: Call a POISON CENTER/doctor/.../if you feel unwell.

P330 Rinse mouth.

P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

WHMIS classification Not controlled

Classification system

HMIS ratings (scale 0-4)

(Hazardous Materials Identification System)

HEALTH 1 Health (acute effects) = 1

FIRE 1 Flammability = 1

REACTIVITY 1 Physical Hazard = 1

Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances

CAS# Description:

85-01-8 Phenanthrene

Identification number(s):

EC number: 201-581-5

4 First-aid measures

Description of first aid measures

After inhalation

Supply fresh air. If required, provide artificial respiration. Keep patient warm.

Seek immediate medical advice.

After skin contact

Immediately wash with water and soap and rinse thoroughly.

Seek immediate medical advice.

After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing Seek medical treatment.

Information for doctor

Most important symptoms and effects, both acute and delayed No further relevant information available.

Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

Product name: Phenanthrene

(Contd. of page 1)

Special hazards arising from the substance or mixture

If this product is involved in a fire, the following can be released:

Carbon monoxide and carbon dioxide

Advice for firefighters

Protective equipment:

Wear self-contained respirator.

Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Wear protective equipment. Keep unprotected persons away.

Ensure adequate ventilation

Environmental precautions: Do not allow product to reach sewage system or any water course.

Methods and material for containment and cleaning up: Dispose of contaminated material as waste according to section 13.

Prevention of secondary hazards: No special measures required.

Reference to other sections

See Section 7 for information on safe handling

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

7 Handling and storage

Handling

Precautions for safe handling

Keep container tightly sealed.

Store in cool, dry place in tightly closed containers.

Ensure good ventilation at the workplace.

Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities

Storage

Requirements to be met by storerooms and receptacles: No special requirements.

Information about storage in one common storage facility: Store away from oxidizing agents.

Further information about storage conditions:

Keep container tightly sealed.

Store in cool, dry conditions in well sealed containers.

Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:

Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace:

The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.

Additional information: No data

Exposure controls

Personal protective equipment

General protective and hygienic measures

The usual precautionary measures for handling chemicals should be followed.

Keep away from foodstuffs, beverages and feed.

Remove all soiled and contaminated clothing immediately.

Wash hands before breaks and at the end of work.

Maintain an ergonomically appropriate working environment.

Breathing equipment: Use suitable respirator when high concentrations are present.

Recommended filter device for short term use:

Use a respirator with type N95 (USA) or PE (EN 143) cartridges as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards.

Protection of hands:

Impervious gloves

Check protective gloves prior to each use for their proper condition.

The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Material of gloves Nitrile rubber, NBR

Penetration time of glove material (in minutes) 480

Glove thickness 0.11 mm

Eye protection: Safety glasses

Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance:

Form: Crystalline powder or flakes

Color: White to pale brown

Odor: Not determined

Odor threshold: Not determined.

pH-value: Not applicable.

Change in condition

Melting point/Melting range: 97-101 °C (207-214 °F)

Boiling point/Boiling range: 340 °C (644 °F)

Sublimation temperature / start: Not determined

Flash point: 171 °C (340 °F)

Flammability (solid, gaseous) Not determined.

Ignition temperature: Not determined

Decomposition temperature: Not determined

Auto igniting: Not determined.

Danger of explosion: Not determined.

Explosion limits:

Lower: Not determined

(Contd. on page 3)

USA

Product name: **Phenanthrene**

(Contd. of page 2)

Upper: Not determined
Vapor pressure: Not applicable.
Density at 20 °C (68 °F): 0.98 g/cm³ (8.178 lbs/gal)
Relative density: Not determined.
Vapor density: Not applicable.
Evaporation rate: Not applicable.
Solubility in / Miscibility with Water: Insoluble
Partition coefficient (n-octanol/water): Not determined.
Viscosity: dynamic: Not applicable.
kinematic: Not applicable.
Other information: No further relevant information available.

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions Reacts with strong oxidizing agents
Conditions to avoid No further relevant information available.
Incompatible materials: Oxidizing agents
Hazardous decomposition products: Carbon monoxide and carbon dioxide

11 Toxicological information

Information on toxicological effects
Acute toxicity: Harmful if swallowed.
The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.
LD/LC50 values that are relevant for classification:
Oral/ LD50/ 1800 mg/kg (rat)
Skin irritation or corrosion: May cause irritation
Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains mutation data for this substance.
Carcinogenicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for this substance.
No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity: No effects known.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.


12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Ecotoxicological effects:
Remark: Very toxic for aquatic organisms
Additional ecological information:
General notes:
Do not allow product to reach ground water, water course or sewage system, even in small quantities.
Danger to drinking water if even extremely small quantities leak into the ground.
Also poisonous for fish and plankton in water bodies.
May cause long lasting harmful effects to aquatic life.
Avoid transfer into the environment.
Very toxic for aquatic organisms
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

UN-Number
DOT, IMDG, IATA UN3077
UN proper shipping name
DOT Environmentally hazardous substances, solid, n.o.s. (Phenanthrene)
IMDG, IATA ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Phenanthrene)
Transport hazard class(es)
DOT, IMDG

Class 9 Miscellaneous dangerous substances and articles.

(Contd. on page 4)
USA

Product name: Phenanthrene

(Contd. of page 3)

Label 9
Class 9 (M7) Miscellaneous dangerous substances and articles
Label 9
IATA



Class 9 Miscellaneous dangerous substances and articles.
Label 9

Packing group III
DOT, IMDG, IATA

Environmental hazards:
Special marking (ADR): Symbol (fish and tree)
Special marking (IATA): Symbol (fish and tree)

Special precautions for user Warning: Miscellaneous dangerous substances and articles
EMS Number: F-A,S-F

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable.

Transport/Additional information:

DOT
Marine Pollutant (DOT): No

UN "Model Regulation": UN3077, Environmentally hazardous substances, solid, n.o.s. (Phenanthrene), 9, III

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
Hazard pictograms



GHS07

Signal word Warning

Hazard statements

H302 Harmful if swallowed.

Precautionary statements

P264 Wash thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.

P301+P312 IF SWALLOWED: Call a POISON CENTER/doctor/.../if you feel unwell.

P330 Rinse mouth.

P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

National regulations

All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.

All components of this product are listed on the Canadian Domestic Substances List (DSL).

SARA Section 313 (specific toxic chemical listings)

85-01-8 Phenanthrene

California Proposition 65

Prop 65 - Chemicals known to cause cancer Substance is not listed.

Prop 65 - Developmental toxicity Substance is not listed.

Prop 65 - Developmental toxicity, female Substance is not listed.

Prop 65 - Developmental toxicity, male Substance is not listed.

Information about limitation of use: For use only by technically qualified individuals.

Other regulations, limitations and prohibitive regulations

Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.

Substance is not listed.

Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.

Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department

Date of preparation / last revision 11/23/2015 / -

Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)

IMDG: International Maritime Code for Dangerous Goods

DOT: US Department of Transportation

IATA: International Air Transport Association

EINECS: European Inventory of Existing Commercial Chemical Substances

CAS: Chemical Abstracts Service (division of the American Chemical Society)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

vPvB: very Persistent and very Bioaccumulative

ACGIH: American Conference of Governmental Industrial Hygienists (USA)

OSHA: Occupational Safety and Health Administration (USA)

NTP: National Toxicology Program (USA)


IARC: International Agency for Research on Cancer

EPA: Environmental Protection Agency (USA)

PHENOL Carbolic acid Phenic acid Hydroxybenzene	ICSC: 0070 (April 2017)
CAS #: 108-95-2 UN #: 1671 EC Number: 203-632-7	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Above 79°C explosive vapour/air mixtures may be formed.	NO open flames. NO contact with strong oxidizing agents. Above 79°C use a closed system and ventilation.	Use water spray, alcohol-resistant foam, powder, carbon dioxide.

AVOID ALL CONTACT! FIRST AID: USE PERSONAL PROTECTION. IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Burning sensation. Cough. Dizziness. Headache. Shortness of breath. Laboured breathing. Unconsciousness. Symptoms may be delayed. See Notes.	Avoid inhalation of dust and mist. Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer for medical attention.
Skin	MAY BE ABSORBED! Serious skin burns. Numbness. Convulsions. Collapse. Unconsciousness.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse skin with plenty of water or shower. To remove substance use polyethylene glycol 300 or vegetable oil. Refer immediately for medical attention .
Eyes	Pain. Redness. Loss of vision. Severe burns.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Sore throat. Burns in mouth and throat. Convulsions. Abdominal pain. Diarrhoea. Shock or collapse.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give one or two glasses of water to drink. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  </div> <p style="text-align: center;">DANGER</p> <p> Toxic if swallowed or in contact with skin Causes severe skin burns and eye damage Suspected of causing genetic defects Causes damage to central nervous system, the heart and kidneys Causes damage to organs through prolonged or repeated exposure May cause respiratory irritation Toxic to aquatic life </p> <p> Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II </p>
STORAGE	
Provision to contain effluent from fire extinguishing. Separated from strong oxidants and food and feedstuffs. Dry. Well closed. Store only in original container. Keep in a well-ventilated room. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



PHENOL**ICSC: 0070****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS-TO-YELLOW OR LIGHT PINK CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers**Chemical dangers**

The solution in water is a weak acid. Reacts with oxidants. This generates fire and explosion hazard.

Formula: C_6H_6O / C_6H_5OH

Molecular mass: 94.1

Boiling point: 182°C

Melting point: 41°C

Density: 1.06 g/cm³

Solubility in water, g/l at 20°C: 84 (moderate)

Vapour pressure, Pa at 20°C: 47

Relative vapour density (air = 1): 3.2

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0

Flash point: 79°C c.c.

Auto-ignition temperature: 715°C

Explosive limits, vol% in air: 1.3-9.5

Octanol/water partition coefficient as log Pow: 1.46

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

Serious local effects by all routes of exposure.

Effects of short-term exposure

The substance and the vapour are corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation of the vapour may cause lung oedema, but only after initial corrosive effects on eyes and/or airways have become manifest. See Notes. The substance may cause effects on the central nervous system, heart and kidneys. This may result in convulsions, coma, cardiac disorders, respiratory failure and collapse. The effects may be delayed. Medical observation is indicated. Exposure could cause death.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure

The substance may have effects on the liver, kidneys and nervous system.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as TWA; (skin); A4 (not classifiable as a human carcinogen); BEI issued.

MAK: skin absorption (H); carcinogen category: 3; germ cell mutagen group: 3B.

EU-OEL: 8 mg/m³, 2 ppm as TWA; 16 mg/m³, 4 ppm as STEL; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES

Other UN numbers: 2312 (molten); 2821 (solution).

Depending on the degree of exposure, periodic medical examination is suggested.

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, C, Xn; R: 23/24/25-34-48/20/21/22-68; S: (1/2)-24/25-26-28-36/37/39-45

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

PYRENE**ICSC: 1474 (November 2003)**Benzo (d,e,f) phenanthrene
beta-Pyrene**CAS #: 129-00-0****EC Number: 204-927-3**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks and NO smoking.	Use water spray, carbon dioxide, dry powder, alcohol-resistant foam, polymer foam.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Avoid inhalation of dust.	Fresh air, rest.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Separated from strong oxidants. Keep in a well-ventilated room.	
PACKAGING	
Do not transport with food and feedstuffs.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

PYRENE**ICSC: 1474****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

PALE YELLOW OR COLOURLESS SOLID IN VARIOUS FORMS.

Physical dangers**Chemical dangers**

Decomposes on heating. This produces irritating fumes.

Formula: C₁₆H₁₀

Molecular mass: 202.26

Boiling point: 404°C

Melting point: 151°C

Density: 1.27 g/cm³

Solubility in water, mg/l at 25°C: 0.135

Vapour pressure, Pa at ?°C: 0.08

Octanol/water partition coefficient as log Pow: 4.88

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

Exposure to sun may enhance the irritating effect of this substance. This may result in chronic skin discoloration.

Inhalation risk

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS**

MAK skin absorption (H)

ENVIRONMENT

Bioaccumulation of this chemical may occur in crustacea, fish, milk, algae and molluscs. It is strongly advised not to let the chemical enter into the environment.

NOTES

Pyrene is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles.

However, pyrene may be encountered as a laboratory chemical in its pure form.

Health effects of exposure to the substance have not been investigated adequately.

See ICSC 1415.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.


ALUMINIUM POWDER (pyrophoric)**ICSC: 0988 (November 2019)**

Aluminum powder

CAS #: 7429-90-5**UN #: 1396 (uncoated)****EC Number: 231-072-3**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Forms flammable gas on contact with water or damp air. Finely dispersed particles form explosive mixtures in air. Risk of fire and explosion on contact with acids, alcohol, oxidizing agents or water.	NO contact with acids, alcohol, oxidizing agents or water. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use dry sand, special powder. NO water. NO carbon dioxide, foam.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Rinse skin with plenty of water or shower.
Eyes	Redness.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered dry containers.	<p>According to UN GHS Criteria</p>  <p>DANGER</p> <p>Catches fire spontaneously if exposed to air In contact with water releases flammable gases</p> <p>Transportation UN Classification UN Hazard Class: 4.3; UN Pack Group: II</p>
STORAGE	
Separated from strong oxidants, strong bases, strong acids, water and halogens. See Chemical Dangers. Dry. Well closed.	
PACKAGING	
Airtight.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



ALUMINIUM POWDER (pyrophoric)**ICSC: 0988****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

SILVERY-WHITE-TO-GREY POWDER.

Physical dangers

Ignites in air when finely divided. Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

Reacts with water and alcohols. Reacts violently with oxidants, strong acids, strong bases, chlorinated hydrocarbons and halogens. This generates fire and explosion hazard.

Formula: Al

Atomic mass: 27.0

Boiling point: 2327°C

Melting point: 660°C

Density: 2.7 g/cm³

Solubility in water: reaction

Auto-ignition temperature: 400°C (powder)

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation.

Effects of short-term exposure**Inhalation risk**

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure

Repeated or prolonged inhalation of dust particles may cause effects on the lungs. The substance may have effects on the nervous system. This may result in impaired functions.

OCCUPATIONAL EXPOSURE LIMITSTLV: 1 mg/m³, as TWA; A4 (not classifiable as a human carcinogen).MAK: (inhalable fraction): 4 mg/m³; (respirable fraction): 1.5 mg/m³; pregnancy risk group: D**ENVIRONMENT****NOTES**

Other UN number: UN1309 Aluminium powder, coated, Hazard class 4.1, Pack group II.

ADDITIONAL INFORMATION**EC Classification**

H250; H261 / H228; H261

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

ANTIMONY

ICSC: 0775 (October 2006)

Antimony black
Antimony regulus
Stibium

CAS #: 7440-36-0

UN #: 2871

EC Number: 231-146-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air. Risk of fire and explosion on contact with acids or halogens.	NO open flames. NO contact with oxidizing agents, halogens or acids. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, foam, powder, carbon dioxide.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. See Ingestion.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Vomiting. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Separated from oxidants, acids, halogens and food and feedstuffs.	
PACKAGING	
Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

ANTIMONY**ICSC: 0775****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

SILVER-WHITE LUSTROUS HARD BRITTLE LUMPS OR DARK GREY POWDER.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

On combustion, forms toxic fumes of antimony oxides (see ICSC 0012).
Reacts violently with oxidants, acids, halogens and powdered metals.
This generates fire and explosion hazard. Contact with acids may generate toxic gas (stibine - see ICSC 0776).

Formula: Sb

Atomic mass: 121.8

Boiling point: 1635 °C

Melting point: 630 °C

Density: 6.7 g/cm³

Solubility in water: none

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol.

Effects of short-term exposure

May cause mechanical irritation to the eyes.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis especially when the skin is exposed to fumes. The substance may have effects on the lungs. This may result in pneumoconiosis.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.5 mg/m³, as TWA.

MAK: (including its inorganic compounds, except stibine): carcinogen category: 2; germ cell mutagen group: 3A

ENVIRONMENT**NOTES**

Other boiling points: 1325°C, 1440°C, 1587 °C, 1750°C.

The recommendations on this card apply only to metallic antimony.

See ICSCs 0012, 0220, 0776 and 1224.


ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

ARSENIC Grey arsenic	ICSC: 0013 (June 2011)
CAS #: 7440-38-2 UN #: 1558 EC Number: 231-148-6	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with incompatible substances. See Chemical Dangers.	NO open flames. NO contact with strong oxidizing agents. NO contact with hot surfaces. NO contact with incompatible materials: See Notes.	Use water spray, powder, foam, carbon dioxide.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	See Ingestion.	Use closed system and ventilation.	Fresh air, rest. Seek medical attention if you feel unwell.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear face shield or eye protection in combination with breathing protection if powder.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Abdominal pain. Diarrhoea. Nausea. Vomiting. Weakness. Shock or collapse. Unconsciousness.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>Toxic if swallowed May cause cancer Suspected of damaging fertility or the unborn child Causes damage to the gastrointestinal tract if swallowed Causes damage to organs through prolonged or repeated exposure Toxic to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II</p>
STORAGE	
Separated from strong oxidants, acids, halogens and food and feedstuffs. Well closed. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

ARSENIC**ICSC: 0013****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

BRITTLE GREY METALLIC-LOOKING CRYSTALS.

Physical dangers

No data.

Chemical dangers

Upon heating, toxic fumes are formed. Reacts violently with strong oxidants and halogens. This generates fire and explosion hazard. Reacts with reducing agents. This produces toxic and flammable arsine gas (See ICSC 0222).

Formula: As

Atomic mass: 74.9

Sublimation point: 613°C

Density: 5.7 g/cm³

Solubility in water: none

Auto-ignition temperature: 180°C

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Effects of short-term exposure

The substance may cause effects on the gastrointestinal tract. This may result in severe gastroenteritis, loss of fluids and electrolytes, cardiac disorders, shock and convulsions. Exposure far above the OEL could cause death. The effects may be delayed. Medical observation is indicated.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure

The substance may have effects on the skin, mucous membranes, peripheral nervous system, liver and bone marrow. This may result in pigmentation disorders, hyperkeratosis, perforation of the nasal septum, neuropathy, anaemia and liver impairment. This substance is carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

MAK: skin absorption (H); carcinogen category: 1; germ cell mutagen group: 3A

ENVIRONMENT

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

The substance is combustible but no flash point is available in literature. Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T, N; R: 23/25-50/53; S: (1/2)-20/21-28-45-60-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

BARIUM**ICSC: 1052 (October 1999)****CAS #: 7440-39-3****UN #: 1400****EC Number: 231-149-1**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Many reactions may cause fire or explosion. Finely dispersed particles form explosive mixtures in air.	NO open flames, NO sparks and NO smoking. NO contact with water. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use special powder, dry sand. NO water.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT wash away into sewer. Sweep spilled substance into covered sealable containers. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 4.3; UN Pack Group: II
STORAGE	
Separated from halogenated solvents, strong oxidants and acids. Dry. Keep under inert gas, oil or oxygen-free liquid.	
PACKAGING	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

BARIUM**ICSC: 1052****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

YELLOWISH-TO-WHITE LUSTROUS SOLID IN VARIOUS FORMS.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

The substance, if in powder form, may ignite spontaneously on contact with air. The substance is a strong reducing agent. It reacts violently with oxidants and acids. Reacts violently with halogenated solvents. Reacts with water. This produces flammable/explosive gas (hydrogen - see ICSC 0001). This generates fire and explosion hazard.

Formula: Ba

Atomic mass: 137.3

Boiling point: 1640°C

Melting point: 725°C

Density: 3.6 g/cm³

Solubility in water: reaction

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract.

Inhalation risk**Effects of long-term or repeated exposure****OCCUPATIONAL EXPOSURE LIMITS**TLV: 0.5 mg/m³, as TWA; A4 (not classifiable as a human carcinogen).MAK: (as Ba, inhalable fraction): 0.5 mg/m³; peak limitation category: II(8); pregnancy risk group: D.EU-OEL: (as Ba): 0.5 mg/m³ as TWA**ENVIRONMENT****NOTES**

Reacts violently with fire extinguishing agents such as water, bicarbonate, powder, foam, and carbon dioxide.

Rinse contaminated clothing with plenty of water because of fire hazard.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

BERYLLIUM Glucinium	ICSC: 0226 (November 2016)
CAS #: 7440-41-7 UN #: 1567 EC Number: 231-150-7	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use fine water spray, dry powder, dry sand. NO other agents.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Laboured breathing. Shortness of breath. Sore throat. Symptoms may be delayed. See Notes.	Use closed system.	Fresh air, rest. Half-upright position. Refer for medical attention.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Wear protective gloves when administering first aid.
Eyes		Wear face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;"> <p>DANGER</p> </div> <p>Flammable solid Fatal if inhaled May cause allergy or asthma symptoms or breathing difficulties if inhaled May cause an allergic skin reaction May cause cancer Causes damage to lungs if inhaled Causes damage to the lungs through prolonged or repeated exposure May cause long lasting harmful effects to aquatic life</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Subsidiary Risks: 4.1; UN Pack Group: II</p>
STORAGE	
Provision to contain effluent from fire extinguishing. Separated from strong acids, bases, chlorinated solvents and food and feedstuffs. Well closed. Store only in original container. Store in an area without drain or sewer access.	
PACKAGING	
Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

BERYLLIUM**ICSC: 0226****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

GREY SOLID IN VARIOUS FORMS.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

Reacts with strong acids and strong bases. This produces flammable/explosive gas (hydrogen - see ICSC 0001). Mixtures with some chlorinated solvents, such as carbon tetrachloride and trichloroethylene are shock-sensitive. On combustion, forms toxic fumes including beryllium oxide (see ICSC 1325).

Formula: Be

Atomic mass: 9.0

Boiling point: >2400°C

Melting point: 1287°C

Density: 1.9 g/cm³

Solubility in water: insoluble

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body in hazardous amounts by inhalation of its aerosol and by ingestion.

Effects of short-term exposure

The substance is irritating to the respiratory tract. Inhalation of dust or fume may cause chemical pneumonitis. The effects may be delayed. Medical observation is indicated. Exposure could cause death.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

Sensitization to the substance, through repeated or prolonged inhalation or skin contact, may result in serious granulomatous lung disease (chronic beryllium disease). This substance is carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (inhalable fraction): 0.00005 mg/m³, as TWA; A1 (confirmed human carcinogen); (skin); (SEN).

MAK: sensitization of respiratory tract and skin (SAH); carcinogen category: 1.

EU-OEL: (inhalable fraction): 0.0002 mg/m³ as TWA; (skin and respiratory sensitizer); (see Notes)

ENVIRONMENT

The substance may cause long-term effects in the aquatic environment.

NOTES

The substance is combustible but no flash point is available in literature.

The symptoms of acute pneumonitis following a massive short-term exposure do not become manifest until 3 days.

Depending on the degree of exposure, periodic medical examination is suggested.

Do NOT take working clothes home.

Isolate contaminated clothing by sealing in a bag or other container.

An EU-OEL of 0.0006 mg/m³ is allowed until 11 July 2026.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T+; R: 49-25-26-36/37/38-43-48/23; S: 53-45; Note: E

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

CADMIUM**ICSC: 0020 (April 2005)****CAS #: 7440-43-9****UN #: 2570****EC Number: 231-152-8**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	May ignite spontaneously on contact with air. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air.	NO open flames, NO sparks and NO smoking. NO contact with heat or acids. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use dry sand. Use special powder. NO other agents.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Headache. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Personal protection: chemical protection suit including self-contained breathing apparatus. Remove all ignition sources. Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1
STORAGE	
Fireproof. Dry. Keep under inert gas. Separated from ignition sources, oxidants, acids and food and feedstuffs.	
PACKAGING	
Airtight. Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

CADMIUM**ICSC: 0020****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

SOFT BLUE-WHITE METAL LUMPS OR GREY POWDER.
MALLEABLE. TURNS BRITTLE ON EXPOSURE TO 80°C. TARNISHES ON EXPOSURE TO MOIST AIR.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

Reacts with acids. This produces flammable/explosive gas (hydrogen - see ICSC 0001). The dust reacts with oxidants, hydrogen azide, zinc, selenium and tellurium. This generates fire and explosion hazard.

Formula: Cd

Atomic mass: 112.4

Boiling point: 765°C

Melting point: 321°C

Density: 8.6 g/cm³

Solubility in water: none

Auto-ignition temperature: 250°C (cadmium metal dust)

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Effects of short-term exposure

The fume is irritating to the respiratory tract. Inhalation of fumes may cause lung oedema. See Notes. Inhalation of fumes may cause metal fume fever. The effects may be delayed. Medical observation is indicated.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure

Repeated or prolonged inhalation of dust particles may cause effects on the lungs. The substance may have effects on the kidneys. This may result in kidney impairment. This substance is carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.01 mg/m³, as TWA; A2 (suspected human carcinogen); BEI issued.

MAK: (including its inorganic compounds, inhalable fraction): skin absorption (H); carcinogen category: 1; germ cell mutagen group: 3A.

EU-OEL: (inhalable fraction): 0.001 mg/m³ as TWA; (see Notes)

ENVIRONMENT**NOTES**

Reacts violently with fire extinguishing agents such as water, foam, carbon dioxide and halons.

Depending on the degree of exposure, periodic medical examination is suggested.

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.

Do NOT take working clothes home.

UN numbers and packing group will vary according to the physical form of the substance.

An EU-OEL of 0.004 mg/m³ is allowed until 11 July 2027.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T+, N; R: 45-26-48/23/25-62-63-68-50/53; S: 53-45-60-61; Note: E

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

CALCIUM POWDER (pyrophoric)**ICSC: 1192 (November 2019)**


Calciat

CAS #: 7440-70-2**UN #: 1855****EC Number: 231-179-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Forms flammable gas on contact with water or damp air. May ignite spontaneously on contact with air. Risk of fire and explosion on contact with water or incompatible substances. See Chemical Dangers.	NO contact with air, water or incompatible substances. PREVENT DISPERSION OF DUST. Use non-sparking handtools.	NO water. Use special powder, dry sand. NO other agents. In case of fire: keep drums, etc., cool by spraying with water. NO direct contact with water.

PREVENT DISPERSION OF DUST! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Burning sensation. Shortness of breath.	Use local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.
Skin	Redness. Pain. Serious skin burns.	Protective gloves. Protective clothing.	Rinse contaminated clothes (fire hazard) with plenty of water. Rinse skin with plenty of water or shower. Refer immediately for medical attention.
Eyes	Redness. Pain. Burns.	Wear safety goggles or face shield.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Burning sensation. Abdominal pain. Abdominal cramps. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: complete protective clothing including self-contained breathing apparatus. Consult an expert! Remove all ignition sources. Cover the spilled material with dry sand or dry powder. Do NOT absorb in saw-dust or other combustible absorbents. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  DANGER Catches fire spontaneously if exposed to air In contact with water releases flammable gases which may ignite spontaneously Causes severe skin burns and eye damage
STORAGE	
Fireproof. Dry. Well closed. Keep under inert gas. Separated from incompatible materials. See Chemical Dangers.	
PACKAGING	
Airtight. Unbreakable packaging. Put breakable packaging into closed unbreakable container.	Transportation UN Classification UN Hazard Class: 4.2; UN Pack Group: I



International
Labour
Organization

World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

CALCIUM POWDER (pyrophoric)**ICSC: 1192****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

SILVERY-WHITE-TO-GREY POWDER.

Physical dangers

Ignites in air when finely divided.

Chemical dangers

The substance is a strong reducing agent. Reacts with moisture, water, alcohols, halogens and many other substances. This produces flammable/explosive gas (hydrogen - see ICSC 0001).

Formula: Ca

Atomic mass: 40.1

Boiling point: 1484°C

Melting point: 837-841°C

Density (at 20°C): 1,54 g/cm³

Solubility in water: reaction

Vapour pressure: negligible

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

Serious local effects by all routes of exposure.

Effects of short-term exposure

The substance is corrosive to the eyes, skin and respiratory tract.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT**

Environmental effects from the substance have not been investigated adequately.

NOTES

Reacts violently with fire extinguishing agents such as water, foam, halons and carbon dioxide.

Do NOT take working clothes home.

Health effects of exposure to the substance have not been investigated adequately.

ADDITIONAL INFORMATION**EC Classification**

H261

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

CHROMIUM**ICSC: 0029 (October 2004)**

Chrome

CAS #: 7440-47-3**EC Number: 231-157-5**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions.	If powder: NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	In case of fire in the surroundings, use appropriate extinguishing media.

PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
PACKAGING	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



CHROMIUM**ICSC: 0029****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

GREY POWDER.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

Chromium is a catalytic substance and may cause reaction in contact with many organic and inorganic substances, causing fire and explosion hazard.

Formula: Cr

Atomic mass: 52.0

Boiling point: 2642°C

Melting point: 1900°C

Density: 7.15 g/cm³

Solubility in water: none

EXPOSURE & HEALTH EFFECTS**Routes of exposure****Effects of short-term exposure**

May cause mechanical irritation to the eyes and respiratory tract.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS**TLV: (as Cr(0), inhalable fraction): 0.5 mg/m³, as TWA**ENVIRONMENT****NOTES**The surface of the chromium particles is oxidized to chromium(III)oxide in air.
See ICSC 1531.**ADDITIONAL INFORMATION****EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

COBALT**ICSC: 0782 (April 2004)****CAS #: 7440-48-4****EC Number: 231-158-0**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	May ignite spontaneously on contact with air. Finely dispersed particles form explosive mixtures in air. Risk of fire and explosion on contact with oxidizing agents or acetylene.	NO contact with oxidizing agents. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use special powder, dry sand. NO other agents.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Shortness of breath. Sore throat. Wheezing.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Separated from strong oxidants.	
PACKAGING	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

COBALT**ICSC: 0782****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

SILVER-GREY POWDER.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

The substance, when finely divided, may ignite spontaneously on contact with air and acetylene. Reacts with strong oxidants. This generates fire and explosion hazard.

Formula: Co

Atomic mass: 58.9

Boiling point: 2870°C

Melting point: 1493°C

Density: 8.9 g/cm³

Solubility in water: none

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation.

Effects of short-term exposure

The fume is irritating to the respiratory tract.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. Repeated or prolonged inhalation may cause asthma. Repeated or prolonged inhalation may cause effects on the lungs. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (inhalable fraction): 0.02 mg/m³, as TWA; (DSEN); (RSEN); A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.

MAK: (inhalable fraction): skin absorption (H); sensitization of respiratory tract and skin (SAH); carcinogen category: 2; germ cell mutagen group: 3A

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish and molluscs.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

The symptoms of asthma often do not become manifest until a few hours have passed and they are aggravated by physical effort.

Rest and medical observation are therefore essential.

Anyone who has shown symptoms of asthma due to this substance should avoid all further contact.

Do NOT take working clothes home.

ADDITIONAL INFORMATION**EC Classification**


Symbol: Xn; R: 42/43-53; S: (2)-22-24-37-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

COPPER**ICSC: 0240 (November 2016)****CAS #: 7440-50-8****UN #: 3089****EC Number: 231-159-6**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Finely dispersed particles form explosive mixtures in air.	NO open flames.	Use special powder, dry sand. NO other agents. Water may be ineffective.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Headache. Shortness of breath. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  DANGER Flammable solid Harmful if swallowed Very toxic to aquatic life with long lasting effects Transportation UN Classification UN Hazard Class: 4.1; UN Pack Group: II
STORAGE	
See Chemical Dangers.	
PACKAGING	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

COPPER**ICSC: 0240****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

SOLID IN VARIOUS FORMS. TURNS GREEN ON EXPOSURE TO MOIST AIR.

Physical dangers

No data.

Chemical dangers

Mixtures with acetylenic compounds, ethylene oxide and azides are shock-sensitive. Reacts with strong oxidants such as chlorates, bromates and iodates. This generates explosion hazard.

Formula: Cu

Atomic mass: 63.5

Boiling point: 2595°C

Melting point: 1083°C

Relative density (water = 1): 8.9

Solubility in water: none

Octanol/water partition coefficient as log Pow: -0.57 (calculated)

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

Inhalation of fumes may cause metal fume fever. See Notes.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. Ingestion may cause effects on the liver.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (fume, as Cu): 0.2 mg/m³, as TWA.

TLV: (dust and mists, as Cu): 1 mg/m³, as TWA.

MAK: (respirable fraction): 0.01 mg/m³; peak limitation category: II(2); pregnancy risk group: C

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur along the food chain.

NOTES

The symptoms of metal fume fever do not become manifest until a few hours have passed.

UN 3089 refers to METAL POWDERS, FLAMMABLE, (n.o.s.)

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1 Identification

Product identifier

Product name: Iron powder

Stock number: 00170

CAS Number:

7439-89-6

EC number:

231-096-4

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Manufacturer/Supplier:

Alfa Aesar

Thermo Fisher Scientific Chemicals, Inc.

30 Bond Street

Ward Hill, MA 01835-8099

Tel: 800-343-0660

Fax: 800-322-4757

Email: tech@alfa.com

www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)



GHS02 Flame

Flam. Sol. 1 H228 Flammable solid.



GHS07

Eye Irrit. 2A H319 Causes serious eye irritation.

STOT SE 3 H335 May cause respiratory irritation.

Hazards not otherwise classified No information known.

Label elements

GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)

Hazard pictograms



GHS02 GHS07

Signal word

Danger

Hazard statements

H228 Flammable solid.

H319 Causes serious eye irritation.

H335 May cause respiratory irritation.

Precautionary statements

P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.

P261 Avoid breathing dust/fume/gas/mist/vapors/spray

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P405 Store locked up.

P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

WHMIS classification

B4 - Flammable solid

D2B - Toxic material causing other toxic effects



Classification system

HMIS ratings (scale 0-4)

(Hazardous Materials Identification System)

HEALTH 1 Health (acute effects) = 1

FIRE 3 Flammability = 3

REACTIVITY 1 Physical Hazard = 1

Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances

CAS# Description:

7439-89-6 Iron

Concentration: ≤100%

Identification number(s):

EC number: 231-096-4

Product name: Iron powder

(Contd. of page 1)

4 First-aid measures

Description of first aid measures

After inhalation

Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.

After skin contact

Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.

After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing Seek medical treatment.

Information for doctor

Most important symptoms and effects, both acute and delayed Causes serious eye irritation.

Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents Special powder for metal fires. Do not use water.

For safety reasons unsuitable extinguishing agents Water

Special hazards arising from the substance or mixture

If this product is involved in a fire, the following can be released:

Iron oxides

Advice for firefighters

Protective equipment:

Wear self-contained respirator.

Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Wear protective equipment. Keep unprotected persons away.

Ensure adequate ventilation

Keep away from ignition sources

Environmental precautions: Do not allow product to reach sewage system or any water course.

Methods and material for containment and cleaning up: Ensure adequate ventilation.

Prevention of secondary hazards: Keep away from ignition sources.

Reference to other sections

See Section 7 for information on safe handling

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

Protective Action Criteria for Chemicals

PAC-1: 3.2 mg/m³

PAC-2: 35 mg/m³

PAC-3: 150 mg/m³

7 Handling and storage

Handling

Precautions for safe handling

Keep container tightly sealed.

Store in cool, dry place in tightly closed containers.

Ensure good ventilation at the workplace.

Information about protection against explosions and fires: Protect against electrostatic charges.

Conditions for safe storage, including any incompatibilities

Storage

Requirements to be met by storerooms and receptacles: Store in a cool location.

Information about storage in one common storage facility:

Do not store together with acids.

Store away from oxidizing agents.

Further information about storage conditions:

Keep container tightly sealed.

Store in cool, dry conditions in well sealed containers.

Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:

Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace:

7439-89-6 Iron (100.0%)

EV (Canada) Long-term value: 1* 5** mg/m³
as iron;*salts, water-soluble;**welding fume

TLV (Canada) Long-term value: 5 mg/m³

Additional information: No data

Exposure controls

Personal protective equipment

General protective and hygienic measures

The usual precautionary measures for handling chemicals should be followed.

Keep away from foodstuffs, beverages and feed.

Remove all soiled and contaminated clothing immediately.

Wash hands before breaks and at the end of work.

Avoid contact with the eyes.

Avoid contact with the eyes and skin.

Maintain an ergonomically appropriate working environment.

Breathing equipment: Use suitable respirator when high concentrations are present.

Recommended filter device for short term use:

Use a respirator with type N95 (USA) or PE (EN 143) cartridges as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards.

(Contd. on page 3)
USA

Product name: Iron powder

(Contd. of page 2)

Protection of hands:

Impervious gloves

Check protective gloves prior to each use for their proper condition.

The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Material of gloves Nitrile rubber, NBR

Penetration time of glove material (in minutes) 480

Glove thickness: 0.11 mm

Eye protection: Safety glasses with side shields / NIOSH (US) or EN 166(EU)

Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance:

Form: Powder
Odor: Not determined
Odor threshold: Not determined.

pH-value: Not applicable.

Change in condition

Melting point/Melting range: 1538 °C (2800 °F)
Boiling point/Boiling range: 2740 °C (4964 °F)
Sublimation temperature / start: Not determined
Flammability (solid, gaseous) Highly flammable.
Ignition temperature: Not determined
Decomposition temperature: Not determined
Auto igniting: Not determined.

Danger of explosion: Not determined.

Explosion limits:

Lower: Not determined
Upper: Not determined
Vapor pressure: Not applicable.
Density at 20 °C (68 °F): 7.87 g/cm³ (65.675 lbs/gal)

Bulk density at 20 °C (68 °F): 2900 kg/m³
Relative density Not determined.
Vapor density Not applicable.
Evaporation rate Not applicable.

Solubility in / Miscibility with
Water: Not determined
Partition coefficient (n-octanol/water): Not determined.

Viscosity:
dynamic: Not applicable.
kinematic: Not applicable.
Other information No further relevant information available.

10 Stability and reactivity

Reactivity No information known.

Chemical stability Stable under recommended storage conditions.

Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.

Possibility of hazardous reactions Reacts with strong oxidizing agents

Conditions to avoid No further relevant information available.

Incompatible materials:

Acids

Oxidizing agents

Hazardous decomposition products: Iron oxides

11 Toxicological information

Information on toxicological effects

Acute toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.

LD/LC50 values that are relevant for classification:

Oral LD50 30000 mg/kg (rat)

Skin irritation or corrosion: May cause irritation

Eye irritation or corrosion: May cause irritation

Sensitization: No sensitizing effects known.

Germ cell mutagenicity: No effects known.

Carcinogenicity:

The Registry of Toxic Effects of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for this substance.

No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.

Reproductive toxicity: No effects known.

Specific target organ system toxicity - repeated exposure: No effects known.

Specific target organ system toxicity - single exposure: May cause respiratory irritation.

Aspiration hazard: No effects known.

Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.

Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity

Aquatic toxicity: No further relevant information available.

Persistence and degradability No further relevant information available.

Bioaccumulative potential No further relevant information available.

Mobility in soil No further relevant information available.

Additional ecological information:

General notes: Avoid transfer into the environment.




(Contd. on page 4)
USA



Product name: *Iron powder*

Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations
Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

UN-Number DOT, IMDG, IATA	UN3089
UN proper shipping name DOT ADR IMDG, IATA	Metal powders, flammable, n.o.s. (Iron) 3089 Metal powders, flammable, n.o.s. METAL POWDER, FLAMMABLE, N.O.S. (Iron)
Transport hazard class(es) DOT  Class Label ADR  Class Label IMDG, IATA  Class Label	4.1 Flammable solids, self-reactive substances and solid desensitised explosives 4.1 4.1 (F3) Flammable solids, self-reactive substances and solid desensitised explosives 4.1 4.1 Flammable solids, self-reactive substances and solid desensitised explosives 4.1
Packing group DOT, ADR, IMDG, IATA	II
Environmental hazards:	Not applicable.
Special precautions for user EMS Number: Segregation groups Stowage Category Handling Code Segregation Code	Warning: Flammable solids, self-reactive substances and solid desensitised explosives F-G, S-G Heavy metals and their salts (including their organometallic compounds), powdered metals B H1 Keep as dry as reasonably practicable SG17 Stow "separated from" class 5.1 SG25 Stow "separated from" goods of classes 2.1 and 3. SG26 In addition: from goods of classes 2.1 and 3 when stowed on deck of a containership a minimum distance of two container spaces athwartship shall be maintained, when stowed on ro-ro ships a distance of 6 m athwartship shall be maintained.
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
Transport/Additional information: DOT Quantity limitations Marine Pollutant (DOT): IMDG Limited quantities (LQ) Excepted quantities (EQ)	On passenger aircraft/rail: 15 kg On cargo aircraft only: 50 kg No 1 kg Code: E2 Maximum net quantity per inner packaging: 30 g Maximum net quantity per outer packaging: 500 g
UN "Model Regulation":	UN 3089 METAL POWDERS, FLAMMABLE, N.O.S., 4.1, II

15 Regulatory information
Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
Hazard pictograms


GHS02 GHS07
Signal word Danger
Hazard statements
H228 Flammable solid.
H319 Causes serious eye irritation.

Product name: Iron powder

(Contd. of page 4)

H335 May cause respiratory irritation.

Precautionary statements

- P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P261 Avoid breathing dust/fume/gas/mist/vapors/spray
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

National regulations

All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.

All components of this product are listed on the Canadian Domestic Substances List (DSL).

SARA Section 313 (specific toxic chemical listings) Substance is not listed.

California Proposition 65

Prop 65 - Chemicals known to cause cancer Substance is not listed.

Prop 65 - Developmental toxicity Substance is not listed.

Prop 65 - Developmental toxicity, female Substance is not listed.

Prop 65 - Developmental toxicity, male Substance is not listed.

Information about limitation of use: For use only by technically qualified individuals.

Other regulations, limitations and prohibitive regulations

Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the

market and use must be observed.

Substance is not listed.

Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.

Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department

Date of preparation/Revision: Print date, revision date and version number are in the header of each page.

Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)

IMDG: International Maritime Code for Dangerous Goods

DOT: US Department of Transportation

IATA: International Air Transport Association

EINECS: European Inventory of Existing Commercial Chemical Substances

CAS: Chemical Abstracts Service (division of the American Chemical Society)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

PBT: Persistent, Bioaccumulative and Toxic

SVHC: Substances of Very High Concern

vPvB: very Persistent and very Bioaccumulative

ACGIH: American Conference of Governmental Industrial Hygienists (USA)

OSHA: Occupational Safety and Health Administration (USA)

NTP: National Toxicology Program (USA)

IARC: International Agency for Research on Cancer

EPA: Environmental Protection Agency (USA)

Flam. Sol. 1: Flammable solids – Category 1


Eye Irrit. 2A: Serious eye damage/eye irritation – Category 2A

STOT SE 3: Specific target organ toxicity (single exposure) – Category 3

LEAD Plumbum	ICSC: 0052 (November 2019)
CAS #: 7439-92-1 UN #: 3077 (n.o.s.) EC Number: 231-100-4	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.	Closed system, ventilation, explosion-proof electrical equipment and lighting.	In case of fire in the surroundings, use appropriate extinguishing media.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Metallic taste. Abdominal pain. Headache. Confusion. Drowsiness. Unconsciousness. Convulsions.	Use local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention. See Notes.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  </div> <p>ANGER</p> <p>Suspected of causing cancer May damage fertility or the unborn child May cause harm to breast-fed children Causes damage to organs Causes damage to organs through prolonged or repeated exposure Toxic to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III</p>
STORAGE	
Store only in original container. Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Store in an area without drain or sewer access.	
PACKAGING	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



LEAD ICSC: 0052	
PHYSICAL & CHEMICAL INFORMATION	
Physical State; Appearance BLUE SILVERY-WHITE-TO-GREY POWDER.	Formula: Pb Atomic mass: [207.2] Boiling point: 1740°C Melting point: 327.5°C Density: 11.34 g/cm ³ Solubility in water, g/l: (practically insoluble)
Physical dangers	
Chemical dangers Upon heating, toxic fumes are formed. Reacts with strong oxidants and strong acids. This generates toxic, fire and explosion hazard.	

EXPOSURE & HEALTH EFFECTS	
Routes of exposure The substance can be absorbed into the body by inhalation and by ingestion.	Inhalation risk A harmful concentration of airborne particles can be reached quickly when dispersed.
Effects of short-term exposure Inhalation of high concentrations may cause effects on multiple organs. See Acute Hazards/Symptoms.	
	Effects of long-term or repeated exposure The substance may have effects on the blood, bone marrow, nervous system and kidneys. This may result in anaemia, encephalopathy (for example, convulsions), peripheral nerve disease, abdominal cramps, kidney impairment, cardiovascular disorders and hearing loss. See Notes. This substance is possibly carcinogenic to humans. Causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS
TLV: 0.05 mg/m ³ , as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued. MAK: carcinogen category: 2; germ cell mutagen group: 3A. EU-OEL: (binding): 0.15 mg/m ³ as TWA

ENVIRONMENT
The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES
Specific treatment may be necessary in case of poisoning with this substance. Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home.

ADDITIONAL INFORMATION
EC Classification

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.
--

MAGNESIUM POWDER (pyrophoric)**ICSC: 0289 (November 2019)****CAS #: 7439-95-4****UN #: 1418****EC Number: 231-104-6**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. May ignite spontaneously on contact with air. Finely dispersed particles form explosive mixtures in air.	NO open flames, NO sparks and NO smoking. NO contact with moisture or any other substances. PREVENT DISPERSION OF DUST. Closed system, dust explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding).	Use dry sand, special powder. NO water. NO other agents. See Notes.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Shortness of breath.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation in the mouth.	Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Remove all ignition sources. Consult an expert! Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered dry containers. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT wash away into sewer.	<p>According to UN GHS Criteria</p> <div> </div> <p>DANGER</p> <p>In contact with water releases flammable gases Catches fire spontaneously if exposed to air</p> <p>Transportation UN Classification UN Hazard Class: 4.3; UN Subsidiary Risks: 4.2; UN Pack Group: I, II, III</p>
STORAGE	
Fireproof. Dry. Well closed. Separated from other incompatible materials.	
PACKAGING	
Airtight.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

MAGNESIUM POWDER (pyrophoric)**ICSC: 0289****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

GREY POWDER.

Physical dangers

Ignites in air when finely divided. Dust explosion possible if in powder or granular form, mixed with air. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc.

Chemical dangers

The substance may ignite spontaneously on contact with air and moisture. This produces irritating or toxic fumes. Reacts with oxidants and many other substances. Reacts with moisture and acids. This produces flammable/explosive gas (hydrogen - see ICSC 0001). This generates fire and explosion hazard.

Formula: Mg

Atomic mass: 24.3

Boiling point: 1100°C

Melting point: 649°C

Density: 1.7 g/cm³

Solubility in water: reaction

Auto-ignition temperature: 473 °C

Explosive limits, vol% in air: see Notes

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of dust.

Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract.

Inhalation risk

A nuisance-causing concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

Lungs may be affected by repeated or prolonged exposure to dust particles.

OCCUPATIONAL EXPOSURE LIMITS**ENVIRONMENT**

Environmental effects of the substance have been adequately investigated, but no significant effects have been found.

NOTES

Burns with an intense flame.

In order to prevent eye injury do not look directly at magnesium fires.

Explosive limits, vol% in air: (LEL) 0.03 kg/m³.

See ICSC 0701.

Reacts violently with fire extinguishing agents such as water, carbon dioxide, halons, powder and foam.

ADDITIONAL INFORMATION**EC Classification**

H250; H260

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

MANGANESE**ICSC: 0174 (November 2003)****CAS #: 7439-96-5****EC Number: 231-105-1**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use dry sand, special powder.

PREVENT DISPERSION OF DUST! AVOID EXPOSURE OF (PREGNANT) WOMEN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Rinse and then wash skin with water and soap.
Eyes		Wear safety goggles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Nausea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria Transportation UN Classification
STORAGE	
Separated from acids. Dry.	
PACKAGING	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

MANGANESE**ICSC: 0174****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

GREY-WHITE POWDER.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

Reacts slowly with water. Reacts more rapidly with steam and acids.
This produces flammable/explosive gas (hydrogen - see ICSC 0001).
This generates fire and explosion hazard.

Formula: Mn

Atomic mass: 54.9

Boiling point: 1962°C

Melting point: 1244°C

Density: 7.47 g/cm³

Solubility in water: none

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Effects of short-term exposure

The aerosol is irritating to the respiratory tract.

Inhalation risk

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Effects of long-term or repeated exposure

The substance may have effects on the lungs and central nervous system. This may result in increased susceptibility to bronchitis, pneumonitis and neurologic and neuropsychiatric disorders (manganism). Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITSTLV: (respirable fraction): 0.02 mg/m³, as TWA.TLV: (inhalable fraction): 0.1 mg/m³, as TWA.

TLV: A4 (not classifiable as a human carcinogen).

EU-OEL: (inhalable fraction): 0.2 mg/m³ as TWA.EU-OEL: (respirable fraction): 0.05 mg/m³ as TWA.MAK: (inhalable fraction): 0.2 mg/m³; (respirable fraction): 0.02 mg/m³; peak limitation category: II(8); pregnancy risk group: C**ENVIRONMENT**

This substance may be hazardous to the environment. Special attention should be given to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

The recommendations on this Card also apply to ferro manganese.


ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

MERCURY Quicksilver Liquid silver	ICSC: 0056 (November 2019)
CAS #: 7439-97-6 UN #: 2809 EC Number: 231-106-7	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Shortness of breath. Fever. Vomiting. Diarrhoea. Abdominal pain. Headache. Weakness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. See Notes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: chemical protection suit and filter respirator for mercury adapted to the airborne concentration of the substance. Ventilation. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable non-metallic containers as far as possible. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p>  <p>DANGER</p> <p>May be corrosive to metals Fatal if inhaled May damage fertility or the unborn child Causes damage to central nervous system and kidneys Causes damage to the central nervous system and the kidneys through prolonged or repeated exposure Very toxic to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 8; UN Subsidiary Risks: 6.1; UN Pack Group: III</p>
STORAGE	
Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Well closed. Store in an area without drain or sewer access.	
PACKAGING	
Special material. Do not transport with food and feedstuffs. Marine pollutant.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



MERCURY**ICSC: 0056****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

ODOURLESS HEAVY MOBILE SILVERY LIQUID METAL.

Physical dangers**Chemical dangers**

Upon heating, toxic fumes are formed. Reacts violently with ammonia, halogens, acetylene and amines. This generates fire and explosion hazard. Attacks aluminium and many other metals. This produces amalgams.

Formula: Hg

Atomic mass: 200.6

Boiling point: 357°C

Melting point: -39°C

Density: 13.5 g/cm³

Solubility in water: none

Vapour pressure, Pa at 20°C: 0.26

Relative vapour density (air = 1): 6.93

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.009

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour and through the skin also as a vapour.

Effects of short-term exposure

The substance is irritating to the skin. Inhalation of high concentrations of the vapour may cause pneumonitis. This may result in death. The substance may cause effects on the central nervous system and kidneys. This may result in tremors and tissue lesions. The effects may be delayed. Medical observation is indicated.

Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

The substance may have effects on the central nervous system and kidneys. This may result in irritability, emotional instability, tremors, mental and memory disturbances and speech disorders. May cause inflammation and discoloration of gums. Cumulative effects are possible. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.025 mg/m³, as TWA; (skin); A4 (not classifiable as a human carcinogen); BEI issued.

EU-OEL: 0,02 mg/m³ as TWA.

MAK: (inhalable fraction): 0.02 mg/m³; peak limitation category: II(8); skin absorption (H); sensitization of skin (SH); carcinogen category: 3; pregnancy risk group: D

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish and seafood.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

There is no odour warning even when toxic concentrations are present.

Do NOT take working clothes home.

Isolate contaminated clothing by sealing in a bag or other container.

Other UN number: 3506 Mercury contained in manufactured articles.

ADDITIONAL INFORMATION**EC Classification**


H330; H372; H400; H410; H360D

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

NICKEL Metallic nickel	ICSC: 0062 (April 2017)
CAS #: 7440-02-0	
EC Number: 231-111-4	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable as dust. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air.	Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use dry sand, dry powder. NO carbon dioxide. NO water.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Shortness of breath.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. See Notes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  DANGER May cause an allergic skin reaction May cause allergy or asthma symptoms or breathing difficulties if inhaled Suspected of causing cancer if inhaled Causes damage to the lungs through prolonged or repeated exposure if inhaled Harmful to aquatic life with long lasting effects
STORAGE	
Store only in original packaging. Cool. Well closed. Separated from strong oxidants and acids. Store in an area without drain or sewer access.	
PACKAGING	
	Transportation UN Classification



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

NICKEL**ICSC: 0062****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

SILVERY METALLIC LUSTROUS SOLID IN VARIOUS FORMS.

Physical dangers

If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc. Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

Reacts violently with acids. This produces flammable hydrogen. This generates fire and explosion hazard. Reacts violently with strong oxidants. This generates fire and explosion hazard. This produces toxic fumes of nickel monoxide. See ICSC 0926. On combustion, forms toxic gases and vapours including nickel (II) oxide (see ICSC 0926) and nickel carbonyl (see ICSC 0064).

Formula: Ni

Atomic mass: 58.7

Boiling point: 2730°C

Melting point: 1455°C

Density: 8.9 g/cm³

Solubility in water, mg/l at 37°C: 1.1 (practically insoluble)

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of dust.

Effects of short-term exposure

May cause mechanical irritation. Inhalation of fume may cause pneumonitis.

Inhalation risk

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. Repeated or prolonged inhalation may cause asthma. The substance may have effects on the respiratory tract. This may result in chronic inflammation of the respiratory tract and fibrosis. This substance is possibly carcinogenic to humans if inhaled.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (inhalable fraction): 1.5 mg/m³, as TWA; A5 (not suspected as a human carcinogen); BEI issued.

MAK: (inhalable fraction): sensitization of respiratory tract and skin (SAH); carcinogen category: 1

ENVIRONMENT

The substance is harmful to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

At high temperatures, toxic fumes of nickel(II)oxide may be formed (see ICSC 0926).

Depending on the degree of exposure, periodic medical examination is suggested.

The symptoms of asthma often do not become manifest until a few hours have passed and they are aggravated by physical effort.

Anyone who has shown symptoms of sensitization due to this substance should avoid all further contact with nickel, nickel compounds and other metal compounds of e.g. copper, chromium and cobalt.

Isolate contaminated clothing by sealing in a bag or other container.

Do NOT take working clothes home.

ADDITIONAL INFORMATION**EC Classification**

Symbol: Xn; R: 40-43; S: (2)-22-36

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

POTASSIUM**ICSC: 0716 (April 2006)**

Kalium

CAS #: 7440-09-7**UN #: 2257****EC Number: 231-119-8**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Many reactions may cause fire or explosion. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with acids, halogens or water.	NO contact with water, acids or halogens. NO open flames, NO sparks and NO smoking.	Use special powder, dry sand. NO other agents. Combat fire from a sheltered position.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation.	Use closed system or ventilation.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	Pain. Blisters. Serious skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
Eyes	Severe deep burns. Loss of vision.	Wear face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Cover the spilled material with dry powder.	<p>According to UN GHS Criteria</p> <div style="text-align: center;"> </div> <p>DANGER</p> <p>In contact with water releases flammable gases which may ignite spontaneously Causes severe skin burns and eye damage</p> <p>Transportation UN Classification UN Hazard Class: 4.3; UN Pack Group: I</p>
STORAGE	
Fireproof. Keep under mineral oil. Dry. Well closed.	
PACKAGING	
Airtight. Unbreakable packaging. Put breakable packaging into closed unbreakable container.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

POTASSIUM**ICSC: 0716****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

WHITE-TO-GREY LUMPS.

Physical dangers**Chemical dangers**

Reacts violently with water. This generates fire and explosion hazard.
Decomposes rapidly under the influence of air and moisture. This produces flammable/explosive gas (hydrogen - see ICSC 0001).

Formula: K

Atomic mass: 39.1

Boiling point: 765.5°C

Melting point: 63.2°C

Density: 0.856 g/cm³

Solubility in water: reaction

Vapour pressure at 20°C: negligible

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

Serious by all routes of exposure.

Effects of short-term exposure

See ICSC 0357 (potassium hydroxide).

Inhalation risk**Effects of long-term or repeated exposure****OCCUPATIONAL EXPOSURE LIMITS****ENVIRONMENT****NOTES**

Potassium is always kept under mineral oil.

Reacts violently with fire extinguishing agents such as water and carbon dioxide.

ADDITIONAL INFORMATION**EC Classification**


Symbol: F, C; R: 14/15-34; S: (1/2)-5-8-45

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

SELENIUM**ICSC: 0072 (November 2009)****CAS #: 7782-49-2****UN #: 3283 (n.o.s.)****EC Number: 231-957-4**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with oxidants.	NO open flames. NO contact with oxidizing agents.	Use foam, powder, carbon dioxide. NO water.

STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Nasal discharge. Loss of smell. Headache.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Garlic breath. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  </div> <p>WARNING</p> <p>May cause respiratory irritation May cause damage to the nervous system and gastrointestinal tract May cause damage to nervous system and gastrointestinal tract through prolonged or repeated exposure Very toxic to aquatic life</p> <p>Transportation UN Classification</p>
STORAGE	
Separated from strong oxidants, strong acids and food and feedstuffs. Dry. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Airtight. Do not transport with food and feedstuffs.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

SELENIUM**ICSC: 0072****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

GREY SOLID IN VARIOUS FORMS.

Physical dangers

No data.

Chemical dangers

Upon heating, toxic fumes are formed. Reacts with oxidants and strong acids. Reacts, if in amorphous form, with water at 50°C. This produces flammable/explosive gas (hydrogen - see ICSC 0001) and selenious acids.

Formula: Se

Atomic mass: 79.0

Boiling point: 685°C

Melting point: 217°C

Relative density (water = 1): 4.8

Solubility in water: none

Vapour pressure, Pa at 20°C: 0.1

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

The substance is irritating to the respiratory tract. The substance may cause effects on the gastrointestinal tract and nervous system.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly on spraying or when dispersed, especially if powdered.

Effects of long-term or repeated exposure

The substance may have effects on the respiratory tract, gastrointestinal tract and skin.

OCCUPATIONAL EXPOSURE LIMITSTLV: 0.2 mg/m³, as TWA.

MAK: (inhalable fraction): 0.02 mg/m³; peak limitation category: II(8); skin absorption (H); carcinogen category: 3; pregnancy risk group: C

ENVIRONMENT

The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Do NOT take working clothes home.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T; R: 23/25-33-53; S: (1/2)-20/21-28-45-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.


SILVERArgentum
C.I. 77820

ICSC: 0810 (November 2019)

CAS #: 7440-22-4**UN #: 3077 (n.o.s.)****EC Number: 231-131-3**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. See Notes.		In case of fire in the surroundings: all extinguishing agents allowed.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles or eye protection in combination with breathing protection if powder.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Give one or two glasses of water to drink.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Collect the spilled substance into containers. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	<p>According to UN GHS Criteria</p>  <p>WARNING</p> <p>Very toxic to aquatic life with long lasting effects</p> <p>Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III</p>
STORAGE	
Separated from : see Chemical Dangers. Store only in original packaging. Store in an area without drain or sewer access.	
PACKAGING	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

SILVER**ICSC: 0810****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

WHITE METAL.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

See Notes. Reacts with many other substances. This generates fire and explosion hazard. Consult your supplier.

Formula: Ag

Atomic mass: 107.9

Boiling point: 2212°C

Melting point: 962°C

Relative density (water = 1): 10.5

Solubility in water, g/100ml: <0.01 (practically insoluble)

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure

May cause mechanical irritation to the eyes and respiratory tract.

Inhalation risk

No indication can be given whether a harmful concentration in the air will be reached.

Effects of long-term or repeated exposure

The substance may cause a grey-blue discolouration of the eyes, nose, throat and skin (argyria/argyrosis).

OCCUPATIONAL EXPOSURE LIMITSTLV: 0.1 mg/m³, as TWA.MAK: (inhalable fraction): 0.1 mg/m³; peak limitation category: II(8); pregnancy risk group: D.EU-OEL: 0.1 mg/m³ as TWA**ENVIRONMENT**

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

Finely divided silver can be combustible and reactive; in its bulk form silver is stable and non-combustible.

There are insufficient data to assess the hazards of this substance in its nanoform (< 100 nm). Therefore the utmost care must be taken when using the substance. Consult your supplier.

ADDITIONAL INFORMATION**EC Classification**

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.


SODIUM**ICSC: 0717 (April 2006)**

Natrium

CAS #: 7440-23-5**UN #: 1428****EC Number: 231-132-9**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Many reactions may cause fire or explosion. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with acids, halogens or water.	NO contact with water, acids or halogens. NO open flames, NO sparks and NO smoking.	Use special powder, dry sand. NO other agents. Combat fire from a sheltered position.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation.	Use closed system or ventilation.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	Pain. Blisters. Serious skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Severe deep burns. Loss of vision.	Wear face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Cover the spilled material with dry powder.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  </div> <p>DANGER</p> <p>In contact with water releases flammable gases which may ignite spontaneously Causes severe skin burns and eye damage</p> <p>Transportation UN Classification UN Hazard Class: 4.3; UN Pack Group: I</p>
STORAGE	
Fireproof. Keep under mineral oil. Dry. Well closed.	
PACKAGING	
Airtight. Unbreakable packaging. Put breakable packaging into closed unbreakable container.	

International
Labour
OrganizationWorld Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

SODIUM**ICSC: 0717****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

SILVERY SOLID IN VARIOUS FORMS.

Physical dangers**Chemical dangers**

Reacts violently with water. This generates fire and explosion hazard.
 Decomposes rapidly under the influence of air and moisture. This produces flammable/explosive gas (hydrogen - see ICSC 0001).

Formula: Na

Atomic mass: 23.0

Boiling point: 880°C

Melting point: 97.4°C

Density: 0.97 g/cm³

Solubility in water: reaction

Vapour pressure at 20°C: negligible

Auto-ignition temperature: 120-125°C

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

Serious by all routes of exposure.

Effects of short-term exposure

See ICSC 0360 (sodium hydroxide).

Inhalation risk**Effects of long-term or repeated exposure****OCCUPATIONAL EXPOSURE LIMITS****ENVIRONMENT****NOTES**

Sodium is always kept under mineral oil.

Reacts violently with fire extinguishing agents such as water and carbon dioxide.

ADDITIONAL INFORMATION**EC Classification**

Symbol: F, C; R: 14/15-34; S: (1/2)-5-8-43-45

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

THALLIUM

ICSC: 0077 (April 2013)

Ramor
Thallium (metal)


CAS #: 7440-28-0

UN #: 1707

EC Number: 231-138-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air.	PREVENT DISPERSION OF DUST.	In case of fire in the surroundings, use appropriate extinguishing media.

See Notes.			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	No acute symptoms expected.	Use ventilation.	
Skin		Protective gloves.	Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Abdominal pain. Nausea. Vomiting. Headache. Weakness. Muscle pain. Blurred vision. Restlessness. Convulsions. Increased heart rate. Symptoms may be delayed. See Notes.	Do not eat, drink, or smoke during work. Wash hands before eating.	Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into sealable containers. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>Fatal if swallowed May cause damage to gastrointestinal tract and the nervous system if swallowed</p> <p>Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II</p>
STORAGE	
Separated from strong acids, fluorine, other halogens and food and feedstuffs. Store only in original container. Well closed.	
PACKAGING	
Do not transport with food and feedstuffs.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



European
Commission

THALLIUM**ICSC: 0077****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

BLUISH-WHITE VERY SOFT METAL. TURNS GREY ON EXPOSURE TO AIR.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

The substance is a strong reducing agent. Reacts with strong acids. Reacts with fluorine and other halogens at room temperature.

Formula: Tl

Atomic mass: 204.4

Boiling point: 1457°C

Melting point: 304°C

Relative density (water = 1): 11.9

Solubility in water: none

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by ingestion.

Effects of short-term exposure

Ingestion could cause effects on the gastrointestinal tract and nervous system. Ingestion could cause hair loss. Ingestion of large amounts could cause death. The effects may be delayed. Medical observation is indicated. See Notes.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly.

Effects of long-term or repeated exposure**OCCUPATIONAL EXPOSURE LIMITS**

TLV: (inhalable fraction): 0.02 mg/m³, as TWA; (skin)

ENVIRONMENT

Environmental effects from the substance have not been investigated adequately.

NOTES

The symptoms of neurological disorders do not become manifest until after a few days.

Depending on the degree of exposure, periodic medical examination is suggested.

Thallium metal is usually kept under mineral oil or an argon atmosphere.

Thallium salts may have different toxicological properties.

See ICSCs 0336 and 1221.

ADDITIONAL INFORMATION**EC Classification**

Symbol: T+; R: 26/28-33-53; S: (1/2)-13-28-45-61

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1 Identification

Product identifier

Product name: Vanadium turnings

Stock number: 10420

CAS Number:

7440-62-2

EC number:

231-171-1

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Manufacturer/Supplier:

Alfa Aesar

Thermo Fisher Scientific Chemicals, Inc.

30 Bond Street

Ward Hill, MA 01835-8099

Tel: 800-343-0660

Fax: 800-322-4757

Email: tech@alfa.com

www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)

The substance is not classified as hazardous according to 29 CFR 1910 (OSHA GHS).

Hazards not otherwise classified No information known.

Label elements

GHS label elements Not applicable

Hazard pictograms Not applicable

Signal word Not applicable

Hazard statements Not applicable

WHMIS classification Not controlled

Classification system

HMIS ratings (scale 0-4)

(Hazardous Materials Identification System)

HEALTH 0 Health (acute effects) = 0

FIRE 0 Flammability = 0

REACTIVITY 0 Physical Hazard = 0

Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances

CAS# Description:

7440-62-2 Vanadium

Concentration: ≤100%

Identification number(s):

EC number: 231-171-1

4 First-aid measures

Description of first aid measures

General information No special measures required.

After inhalation Seek medical treatment in case of complaints.

After skin contact Generally the product does not irritate the skin.

After eye contact Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.

After swallowing If symptoms persist consult doctor.

Information for doctor

Most important symptoms and effects, both acute and delayed No further relevant information available.

Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents Special powder for metal fires. Do not use water.

For safety reasons unsuitable extinguishing agents Water

Special hazards arising from the substance or mixture

If this product is involved in a fire, the following can be released:

Vanadium oxides

Advice for firefighters

Protective equipment: No special measures required.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures Not required.

Environmental precautions: Do not allow product to reach sewage system or any water course.

Methods and material for containment and cleaning up: Pick up mechanically.

Prevention of secondary hazards: No special measures required.

Reference to other sections

See Section 7 for information on safe handling

See Section 8 for information on personal protection equipment.

Product name: Vanadium turnings	(Contd. of page 1)
See Section 13 for disposal information. Protective Action Criteria for Chemicals PAC-1: 3 mg/m3 PAC-2: 5.8 mg/m3 PAC-3: 35 mg/m3	

7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Information about protection against explosions and fires: No special measures required.
Conditions for safe storage, including any incompatibilities
Storage
Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility:
Do not store together with acids.
Store away from oxidizing agents.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems: No further data; see section 7.
Control parameters
Components with limit values that require monitoring at the workplace:
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.
Additional information: No data
Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Not required.
Recommended filter device for short term use:
Use a respirator with type N95 (USA) or PE (EN 143) cartridges as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards.
Protection of hands: Not required.
Material of gloves Nitrile rubber, NBR
Penetration time of glove material (in minutes) 480

Glove thickness: 0.11 mm
Eye protection: Safety glasses with side shields / NIOSH (US) or EN 166(EU)
Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties
General Information
Appearance:
Form: Solid in various forms
Odor: Odorless
Odor threshold: Not determined.
pH-value: Not applicable.
Change in condition
Melting point/Melting range: 1910 °C (3470 °F)
Boiling point/Boiling range: 3407 °C (6165 °F)
Sublimation temperature / start: Not determined.
Flammability (solid, gaseous) Not determined.
Ignition temperature: Not determined.
Decomposition temperature: Not determined.
Auto igniting: Not determined.
Danger of explosion: Not determined.
Explosion limits:
Lower: Not determined
Upper: Not determined
Vapor pressure: Not applicable.
Density at 20 °C (68 °F): 6.11 g/cm³ (50.988 lbs/gal)
Bulk density at 20 °C (68 °F): 4000 kg/m³
Relative density Not determined.
Vapor density Not applicable.
Evaporation rate Not applicable.
Solubility in / Miscibility with
Water: Insoluble
Partition coefficient (n-octanol/water): Not determined.
Viscosity:
dynamic: Not applicable.
kinematic: Not applicable.
Other information No further relevant information available.

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions Reacts with strong oxidizing agents
Conditions to avoid No further relevant information available.

Product name: Vanadium turnings

Incompatible materials:
Acids
Oxidizing agents
Hazardous decomposition products: Vanadium oxides

(Contd. of page 2)

11 Toxicological information

Information on toxicological effects
Acute toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.
LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: May cause irritation
Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: No effects known.
Carcinogenicity:
The Registry of Toxic Effects of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for this substance.
No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity: No effects known.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Additional ecological information:
General notes: Avoid transfer into the environment.
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

UN-Number DOT, ADN, IMDG, IATA	Not applicable
UN proper shipping name DOT, ADR, ADN, IMDG, IATA	Not applicable
Transport hazard class(es) DOT, ADR, ADN, IMDG, IATA Class	Not applicable
Packing group DOT, ADR, IMDG, IATA	Not applicable
Environmental hazards:	Not applicable.
Special precautions for user	Not applicable.
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
Transport/Additional information:	
DOT Marine Pollutant (DOT):	No
UN "Model Regulation":	Not applicable

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements Not applicable
Hazard pictograms Not applicable
Signal word Not applicable
Hazard statements Not applicable
National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).
SARA Section 313 (specific toxic chemical listings)
7440-62-2 | Vanadium
California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use: For use only by technically qualified individuals.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

(Contd. on page 4)
USA

Product name: Vanadium turnings

(Contd. of page 3)

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.
Substance is not listed.
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.
Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information
Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department
Date of preparation/Revision: Print date, revision date and version number are in the header of each page.

Abbreviations and acronyms:
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
SVHC: Substances of Very High Concern
vPvB: very Persistent and very Bioaccumulative
ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)

USA

ZINC POWDER (pyrophoric)**ICSC: 1205 (November 2019)**Blue powder
Merrillite**CAS #: 7440-66-6****UN #: 1436 (zinc powder or dust)****EC Number: 231-175-3**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. May ignite spontaneously on contact with air. Many reactions may cause fire or explosion. Finely dispersed particles form explosive mixtures in air. Risk of fire and explosion on contact with water or incompatible substances. See Chemical Dangers.	NO open flames, NO sparks and NO smoking. NO contact with oxidizing agents, acids, bases, water or incompatible substances. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Prevent deposition of dust.	Use special powder, dry sand. NO water. NO foam, carbon dioxide. NO other agents. In case of fire: keep drums, etc., cool by spraying with water. NO direct contact of the substance with water.

PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Metallic taste. Sore throat. Cough. Weakness. Fever. See Effects of short-term exposure.	Use local exhaust.	Fresh air, rest. Seek medical attention if you feel unwell. See Notes.
Skin	No acute symptoms expected.	Protective gloves.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again.
Eyes	Redness.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL

Remove all ignition sources. Consult an expert! Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Sweep spilled substance into covered dry containers. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Well closed. Separated from incompatible materials and : see Chemical Dangers. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Airtight.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

**DANGER**

Catches fire spontaneously if exposed to air
In contact with water releases flammable gases which may ignite spontaneously
Very toxic to aquatic life with long lasting effects

Transportation
UN Classification

UN Hazard Class: 4.3; UN Subsidiary Risks: 4.2

International
Labour
Organization
World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021

European
Commission

ZINC POWDER (pyrophoric)**ICSC: 1205****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

GREY-TO-BLUE POWDER.

Physical dangers

Ignites in air when finely divided. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc.

Chemical dangers

On combustion forms zinc oxide fumes. See Notes. The substance is a strong reducing agent. It reacts violently with oxidants, acids and bases. Reacts with water. This produces flammable/explosive gas (hydrogen - see ICSC 0001). Reacts violently with sulfur, halogenated hydrocarbons and many other substances. This generates fire and explosion hazard.

Formula: Zn

Atomic mass: 65.4

Boiling point: 907°C

Melting point: 419°C

Density: 7.1 g/cm³

Solubility in water: reaction

Auto-ignition temperature: 460°C

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation.

Effects of short-term exposure

May cause mechanical irritation to the eyes and respiratory tract. Inhalation of the respirable fraction may cause metal fume fever. This may result in influenza-like symptoms. The effects may be delayed up to 48 hours.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered or as fumes.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. Repeated or prolonged inhalation may cause effects on the lungs. This may result in reduced lung function.

OCCUPATIONAL EXPOSURE LIMITS

MAK: (as Zn, respirable fraction): 0.1 mg/m³; peak limitation category: I(4); (as Zn, inhalable fraction): 2 mg/m³; peak limitation category: I(2); pregnancy risk group: C; (DFG 2019)

ENVIRONMENT

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Zinc oxide fumes formed during combustion may cause metal fume fever (see ICSC 0208).

The symptoms of metal fume fever do not become manifest until hours.

Zinc may contain trace amounts of arsenic, when forming hydrogen, may also form toxic gas arsine (see ICSC0001 and ICSC0222).

Zinc powder stabilized: Combustible solid, UN number: 3077, Hazard class: 9, Packing group: III; GHS: Warning, H400, H410.

ADDITIONAL INFORMATION**EC Classification**

H250; H260; H400 / H400; H410

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1,4-DIOXANE**ICSC: 0041 (November 2008)**


1,4-Diethylene dioxide
Dioxane
para-Dioxane

CAS #: 123-91-1**UN #: 1165****EC Number: 204-661-8**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive. Risk of fire and explosion on contact with incompatible substances. See Chemical Dangers.	NO open flames, NO sparks and NO smoking. NO contact with strong oxidizing agents. NO contact with hot surfaces. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	Use powder, alcohol-resistant foam, water spray, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Nausea. Dizziness. Headache. Drowsiness. Vomiting. Unconsciousness. Abdominal pain.	Use ventilation (not if powder), local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible).
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Seek medical attention if you feel unwell.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking liquid in sealable air tight containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.	<p>According to UN GHS Criteria</p>  <p>DANGER</p> <p>Highly flammable liquid and vapour Causes eye irritation May cause respiratory irritation Suspected of causing cancer May be harmful if swallowed and enters airways</p> <p>Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II</p>
STORAGE	
Fireproof. Separated from strong oxidants, strong acids and incompatible materials. Cool. Dry. Well closed. Keep in the dark. Store only if stabilized. Store in an area without drain or sewer access.	
PACKAGING	
Airtight.	



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
© ILO and WHO 2021



1,4-DIOXANE**ICSC: 0041****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers

The substance can form explosive peroxides on exposure to air. Reacts with oxidants and strong acids. Reacts violently with some catalysts.

Formula: C₄H₈O₂

Molecular mass: 88.1

Boiling point: 101°C

Melting point: 12°C

Relative density (water = 1): 1.03

Solubility in water: miscible

Vapour pressure, kPa at 20°C: 3.9

Relative vapour density (air = 1): 3.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.08

Flash point: 12°C c.c.

Auto-ignition temperature: 180°C

Explosive limits, vol% in air: 2-22.0

Octanol/water partition coefficient as log Pow: -0.27

Viscosity: 1.17 mm²/s at 25°C**EXPOSURE & HEALTH EFFECTS****Routes of exposure**

The substance can be absorbed into the body by inhalation of its vapour and through the skin.

Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis. Exposure at high levels could cause lowering of consciousness.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C, on spraying or dispersing much faster.

Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system, kidneys and liver. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 37 mg/m³, 10 ppm; peak limitation category: I(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.EU-OEL: 73 mg/m³, 20 ppm as TWA**ENVIRONMENT****NOTES**

Refer for medical attention if breathing difficulties and/or fever develop.

Check for peroxides prior to distillation; eliminate if found.

ADDITIONAL INFORMATION**EC Classification**

Symbol: F, Xn; R: 11-19-36/37-40-66; S: (2)-9-16-36/37-46; Note: D

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

1H,1H,2H,2H-Perfluorooctanesulfonic acid

Safety Data Sheet 6164306

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 12/10/2015

Version: 1.0

SECTION 1: Identification

1.1. Identification

Product form	: Substance
Substance name	: 1H,1H,2H,2H-Perfluorooctanesulfonic acid
CAS No	: 27619-97-2
Product code	: 6164-3-06
Formula	: C ₈ H ₅ F ₁₃ O ₃ S
Synonyms	: 3,3,4,4,5,5,6,6,7,7,8,8-Tridecafluorooctanesulfonic acid
Other means of identification	: MFCD00042455

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	: Laboratory chemicals Manufacture of substances Scientific research and development
------------------------------	--

1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.
P.O. Box 309
Alachua, FL 32615 - United States of America
T (386) 462-0788 - F (386) 462-7097
info@synquestlabs.com - www.synquestlabs.com

1.4. Emergency telephone number

Emergency number	: (844) 523-4086 (3E Company - Account 10069)
------------------	---

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Acute Tox. 4 (Oral)	H302 - Harmful if swallowed
Skin Corr. 1B	H314 - Causes severe skin burns and eye damage
Eye Dam. 1	H318 - Causes serious eye damage
STOT SE 3	H335 - May cause respiratory irritation

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US)



GHS05

GHS07

Signal word (GHS-US)

: Danger

Hazard statements (GHS-US)

: H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H335 - May cause respiratory irritation

Precautionary statements (GHS-US)

: P260 - Do not breathe dust, mist, 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
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301+P312 - If swallowed: Call a POISON CENTER or doctor/ physician if you feel unwell
P301+P330+P331 - If swallowed: rinse mouth. Do NOT induce vomiting
P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/ physician
P321 - Specific treatment (see supplemental first aid instructions on this label)
P330 - Rinse mouth

1H,1H,2H,2H-Perfluorooctanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

P363 - Wash contaminated clothing before reuse
P403+P233 - 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

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
1H,1H,2H,2H-Perfluorooctanesulfonic acid (Main constituent)	(CAS No) 27619-97-2	<= 100	Acute Tox. 4 (Oral), H302 Skin Corr. 1B, H314 Eye Dam. 1, H318 STOT SE 3, H335

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Get immediate medical advice/attention.

First-aid measures after skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Get immediate medical advice/attention.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.

First-aid measures after ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth out with water. Get immediate medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

Symptoms/injuries after inhalation : Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen fluoride. Sulfur oxides.

5.3. Advice for firefighters

Firefighting instructions : In case of fire: Evacuate area.

Protection during firefighting : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe dust.

6.1.1. For non-emergency personnel

Emergency procedures : Only qualified personnel equipped with suitable protective equipment may intervene.

1H,1H,2H,2H-Perfluorooctanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment : Stop leak if safe to do so.
Methods for cleaning up : Sweep or shovel spills into appropriate container for disposal. Minimize generation of dust.
Other information : For disposal of solid materials or residues refer to section 13 : "Disposal considerations".

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Ensure good ventilation of the work station. Do not breathe dust, mist, spray. Wear personal protective equipment. Avoid contact with skin and eyes.
Hygiene measures : Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Comply with applicable regulations.
Storage conditions : Keep container closed when not in use. Hygroscopic. Keep contents under inert gas.
Incompatible materials : Refer to Section 10 on Incompatible Materials.
Storage area : Store in dry, cool, well-ventilated area.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Exposure controls

Appropriate engineering controls : Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Hand protection : Protective gloves. 29 CFR 1910.138: Hand Protection.
Eye protection : Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.
Skin and body protection : Wear suitable protective clothing.
Respiratory protection : In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory Protection.
Other information : Safety shoes. 29 CFR 1910.136: Foot Protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Solid
Color : No data available
Odor : No data available
Odor threshold : No data available
pH : No data available
Melting point : > 300 °C
Freezing point : No data available
Boiling point : No data available
Flash point : No data available
Relative evaporation rate (butyl acetate=1) : No data available
Flammability (solid, gas) : No data available
Explosion limits : No data available
Explosive properties : No data available

1H,1H,2H,2H-Perfluorooctanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Oxidizing properties	: No data available
Vapor pressure	: No data available
Relative density	: No data available
Relative vapor density at 20 °C	: No data available
Molecular mass	: 428.17 g/mol
Solubility	: No data available
Log Pow	: No data available
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Viscosity	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

The product is stable at normal handling and storage conditions.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong bases. Strong oxidizing agents.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	: Oral: Harmful if swallowed.
Skin corrosion/irritation	: Causes severe skin burns and eye damage.
Serious eye damage/irritation	: Causes serious eye damage.
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
Specific target organ toxicity (single exposure)	: May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	: Not classified
Aspiration hazard	: Not classified
Symptoms/injuries after inhalation	: Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.

SECTION 12: Ecological information

12.1. Toxicity

No additional information available

12.2. Persistence and degradability

No additional information available

1H,1H,2H,2H-Perfluorooctanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

- | | |
|--------------------------------|---|
| Waste treatment methods | : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber. |
| Waste disposal recommendations | : Dispose of contents/container in accordance with licensed collector's sorting instructions. |
| Additional information | : Recycle the material as far as possible. |

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN3261 Corrosive solid, acidic, organic, n.o.s., 8, III

UN-No.(DOT) : UN3261

Proper Shipping Name (DOT) : Corrosive solid, acidic, organic, n.o.s.

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Hazard labels (DOT) : 8 - Corrosive



Packing group (DOT) : III - Minor Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 213

DOT Packaging Bulk (49 CFR 173.xxx) : 240

DOT Symbols : G - Identifies PSN requiring a technical name

DOT Special Provisions (49 CFR 172.102) : IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).
IP3 - Flexible IBCs must be sift-proof and water-resistant or must be fitted with a sift-proof and water-resistant liner.

T1 - 1.5 178.274(d)(2) Normal..... 178.275(d)(2)

TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 25 kg

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 100 kg

DOT Vessel Stowage Location : A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel.

Other information : No supplementary information available.

1H,1H,2H,2H-Perfluorooctanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

TDG

No additional information available

Transport by sea

UN-No. (IMDG) : 3261
Proper Shipping Name (IMDG) : CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S.
Class (IMDG) : 8 - Corrosive substances
Packing group (IMDG) : III - substances presenting low danger

Air transport

UN-No. (IATA) : 3261
Proper Shipping Name (IATA) : Corrosive solid, acidic, organic, n.o.s.
Class (IATA) : 8 - Corrosives
Packing group (IATA) : III - Minor Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

1H,1H,2H,2H-Perfluorooctanesulfonic acid (27619-97-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

1H,1H,2H,2H-Perfluorooctanesulfonic acid (27619-97-2)

Listed on the Canadian NDSL (Non-Domestic Substances List)

EU-Regulations

No additional information available

National regulations

1H,1H,2H,2H-Perfluorooctanesulfonic acid (27619-97-2)

Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Japanese ISHL (Industrial Safety and Health Law)
Listed on NZIoC (New Zealand Inventory of Chemicals)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

SECTION 16: Other information

Full text of H-phrases:

Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Skin Corr. 1B	Skin corrosion/irritation Category 1B
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H335	May cause respiratory irritation

1H,1H,2H,2H-Perfluorooctanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

NFPA health hazard

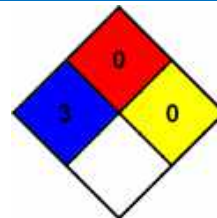
: 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.

NFPA fire hazard

: 0 - Materials that will not burn.

NFPA reactivity

: 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health

: 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability

: 0 Minimal Hazard - Materials that will not burn

Physical

: 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable or any damage resulting from handling or from contact with the above product.

1H,1H,2H,2H-Perfluorodecanesulfonic acid

Safety Data Sheet 61643X3

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 12/10/2015

Version: 1.0

SECTION 1: Identification

1.1. Identification

Product form	: Substance
Substance name	: 1H,1H,2H,2H-Perfluorodecanesulfonic acid
CAS No	: 39108-34-4
Product code	: 6164-3-X3
Formula	: C ₁₀ H ₅ F ₁₇ O ₃ S
Synonyms	: 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-Heptafluorodecane-1-sulfonic acid
Other means of identification	: MFCD14584757

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	: Laboratory chemicals Manufacture of substances Scientific research and development
------------------------------	--

1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.
P.O. Box 309
Alachua, FL 32615 - United States of America
T (386) 462-0788 - F (386) 462-7097
info@synquestlabs.com - www.synquestlabs.com

1.4. Emergency telephone number

Emergency number	: (844) 523-4086 (3E Company - Account 10069)
------------------	---

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Acute Tox. 4 (Oral)	H302 - Harmful if swallowed
Skin Corr. 1B	H314 - Causes severe skin burns and eye damage
Eye Dam. 1	H318 - Causes serious eye damage
STOT SE 3	H335 - May cause respiratory irritation

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US)



GHS05

GHS07

Signal word (GHS-US)

: Danger

Hazard statements (GHS-US)

: H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H335 - May cause respiratory irritation

Precautionary statements (GHS-US)

: P260 - Do not breathe dust, mist, 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
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301+P312 - If swallowed: Call a POISON CENTER or doctor/ physician if you feel unwell
P301+P330+P331 - If swallowed: rinse mouth. Do NOT induce vomiting
P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/ physician
P321 - Specific treatment (see supplemental first aid instructions on this label)
P330 - Rinse mouth

1H,1H,2H,2H-Perfluorodecanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

P363 - Wash contaminated clothing before reuse
P403+P233 - 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

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
1H,1H,2H,2H-Perfluorodecanesulfonic acid (Main constituent)	(CAS No) 39108-34-4	<= 100	Acute Tox. 4 (Oral), H302 Skin Corr. 1B, H314 Eye Dam. 1, H318 STOT SE 3, H335

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Get immediate medical advice/attention.

First-aid measures after skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Get immediate medical advice/attention.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.

First-aid measures after ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth out with water. Get immediate medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

Symptoms/injuries after inhalation : Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen fluoride. Sulfur oxides.

5.3. Advice for firefighters

Firefighting instructions : In case of fire: Evacuate area.

Protection during firefighting : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe dust.

6.1.1. For non-emergency personnel

Emergency procedures : Only qualified personnel equipped with suitable protective equipment may intervene.

1H,1H,2H,2H-Perfluorodecanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment : Stop leak if safe to do so.
Methods for cleaning up : Sweep or shovel spills into appropriate container for disposal. Minimize generation of dust.
Other information : For disposal of solid materials or residues refer to section 13 : "Disposal considerations".

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Ensure good ventilation of the work station. Do not breathe dust, mist, spray. Wear personal protective equipment. Avoid contact with skin and eyes.
Hygiene measures : Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Comply with applicable regulations.
Storage conditions : Keep container closed when not in use. Hygroscopic. Keep contents under inert gas.
Incompatible materials : Refer to Section 10 on Incompatible Materials.
Storage area : Store in dry, cool, well-ventilated area.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Exposure controls

Appropriate engineering controls : Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Hand protection : Protective gloves. 29 CFR 1910.138: Hand Protection.
Eye protection : Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.
Skin and body protection : Wear suitable protective clothing.
Respiratory protection : In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory Protection.
Other information : Safety shoes. 29 CFR 1910.136: Foot Protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Solid
Color : No data available
Odor : No data available
Odor threshold : No data available
pH : No data available
Melting point : No data available
Freezing point : No data available
Boiling point : No data available
Flash point : No data available
Relative evaporation rate (butyl acetate=1) : No data available
Flammability (solid, gas) : No data available
Explosion limits : No data available
Explosive properties : No data available

1H,1H,2H,2H-Perfluorodecanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Oxidizing properties	: No data available
Vapor pressure	: No data available
Relative density	: No data available
Relative vapor density at 20 °C	: No data available
Molecular mass	: 528.18 g/mol
Solubility	: No data available
Log Pow	: No data available
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Viscosity	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

The product is stable at normal handling and storage conditions.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong bases. Strong oxidizing agents.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	: Oral: Harmful if swallowed.
Skin corrosion/irritation	: Causes severe skin burns and eye damage.
Serious eye damage/irritation	: Causes serious eye damage.
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
Specific target organ toxicity (single exposure)	: May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	: Not classified
Aspiration hazard	: Not classified
Symptoms/injuries after inhalation	: Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.

SECTION 12: Ecological information

12.1. Toxicity

No additional information available

12.2. Persistence and degradability

No additional information available

1H,1H,2H,2H-Perfluorodecanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

- | | |
|--------------------------------|---|
| Waste treatment methods | : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber. |
| Waste disposal recommendations | : Dispose of contents/container in accordance with licensed collector's sorting instructions. |
| Additional information | : Recycle the material as far as possible. |

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN3261 Corrosive solid, acidic, organic, n.o.s., 8, III

UN-No.(DOT) : UN3261

Proper Shipping Name (DOT) : Corrosive solid, acidic, organic, n.o.s.

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Hazard labels (DOT) : 8 - Corrosive



Packing group (DOT) : III - Minor Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 213

DOT Packaging Bulk (49 CFR 173.xxx) : 240

DOT Symbols : G - Identifies PSN requiring a technical name

DOT Special Provisions (49 CFR 172.102) : IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).
IP3 - Flexible IBCs must be sift-proof and water-resistant or must be fitted with a sift-proof and water-resistant liner.

T1 - 1.5 178.274(d)(2) Normal..... 178.275(d)(2)

TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 25 kg

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 100 kg

DOT Vessel Stowage Location : A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel.

Other information : No supplementary information available.

1H,1H,2H,2H-Perfluorodecanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

TDG

No additional information available

Transport by sea

UN-No. (IMDG) : 3261
Proper Shipping Name (IMDG) : CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S.
Class (IMDG) : 8 - Corrosive substances
Packing group (IMDG) : III - substances presenting low danger

Air transport

UN-No. (IATA) : 3261
Proper Shipping Name (IATA) : Corrosive solid, acidic, organic, n.o.s.
Class (IATA) : 8 - Corrosives
Packing group (IATA) : III - Minor Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory except for:

1H,1H,2H,2H-Perfluorodecanesulfonic acid	CAS No 39108-34-4	100%
--	-------------------	------

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

No additional information available

EU-Regulations

No additional information available

National regulations

1H,1H,2H,2H-Perfluorodecanesulfonic acid (39108-34-4)

Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Japanese ISHL (Industrial Safety and Health Law)
Listed on NZIoC (New Zealand Inventory of Chemicals)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

SECTION 16: Other information

Full text of H-phrases:

Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Skin Corr. 1B	Skin corrosion/irritation Category 1B
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H335	May cause respiratory irritation

1H,1H,2H,2H-Perfluorodecanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

NFPA health hazard

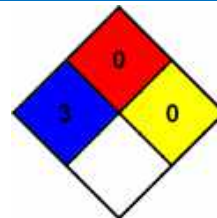
: 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.

NFPA fire hazard

: 0 - Materials that will not burn.

NFPA reactivity

: 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health

: 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability

: 0 Minimal Hazard - Materials that will not burn

Physical

: 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable or any damage resulting from handling or from contact with the above product.

Perfluorooctanesulfonamide

Safety Data Sheet 8169308

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 04/04/2016

Version: 1.0

SECTION 1: Identification

1.1. Identification

Product form	: Substance
Substance name	: Perfluorooctanesulfonamide
CAS No	: 754-91-6
Product code	: 8169-3-08
Formula	: C ₈ H ₂ F ₁₇ NO ₂ S
Synonyms	: 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-Heptadecafluorooctane-1-sulfonamide
Other means of identification	: MFCD03094345

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	: Laboratory chemicals Manufacture of substances Scientific research and development
------------------------------	--

1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.
P.O. Box 309
Alachua, FL 32615 - United States of America
T (386) 462-0788 - F (386) 462-7097
info@synquestlabs.com - www.synquestlabs.com

1.4. Emergency telephone number

Emergency number	: (844) 523-4086 (3E Company - Account 10069)
------------------	---

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Skin Irrit. 2	H315 - Causes skin irritation
Eye Irrit. 2A	H319 - Causes serious eye irritation
STOT SE 3	H335 - May cause respiratory irritation

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US)



GHS07

Signal word (GHS-US)

: Warning

Hazard statements (GHS-US)

: H315 - Causes skin irritation
H319 - Causes serious eye irritation
H335 - May cause respiratory irritation

Precautionary statements (GHS-US)

: P261 - Avoid breathing dust, mist, spray
P264 - Wash skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302+P352 - If on skin: Wash with plenty of soap and water
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P312 - Call a POISON CENTER or doctor/physician if you feel unwell
P321 - Specific treatment (see supplemental first aid instructions on this label)
P332+P313 - If skin irritation occurs: Get medical advice/attention
P337+P313 - If eye irritation persists: Get medical advice/attention
P362+P364 - Take off contaminated clothing and wash it before reuse
P403+P233 - 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

Perfluorooctanesulfonamide

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
Perfluorooctanesulfonamide (Main constituent)	(CAS No) 754-91-6	<= 100	Skin Irrit. 2, H315 Eye Irrit. 2A, H319 STOT SE 3, H335

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

- First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.
- First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Get medical advice/attention.
- First-aid measures after skin contact : Wash with plenty of soap and water. Get medical advice/attention.
- First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/attention.
- First-aid measures after ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth out with water. Get medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed

- Symptoms/injuries : The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

- Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen fluoride. Nitrogen oxides. Sulfur oxides.

5.3. Advice for firefighters

- Firefighting instructions : In case of fire: Evacuate area.
- Protection during firefighting : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

- General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe dust.

6.1.1. For non-emergency personnel

- Emergency procedures : Only qualified personnel equipped with suitable protective equipment may intervene.

6.1.2. For emergency responders

- Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

Perfluorooctanesulfonamide

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

6.3. Methods and material for containment and cleaning up

- For containment : Stop leak if safe to do so.
- Methods for cleaning up : Sweep or shovel spills into appropriate container for disposal. Minimize generation of dust.
- Other information : For disposal of solid materials or residues refer to section 13 : "Disposal considerations".

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Ensure good ventilation of the work station. Do not breathe dust, mist, spray. Wear personal protective equipment. Avoid contact with skin and eyes.
- Hygiene measures : Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

- Technical measures : Comply with applicable regulations.
- Storage conditions : Keep container closed when not in use.
- Incompatible materials : Refer to Section 10 on Incompatible Materials.
- Storage area : Store in dry, cool, well-ventilated area.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Exposure controls

- Appropriate engineering controls : Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
- Hand protection : Protective gloves. 29 CFR 1910.138: Hand Protection.
- Eye protection : Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.
- Skin and body protection : Wear suitable protective clothing.
- Respiratory protection : In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory Protection.
- Other information : Safety shoes. 29 CFR 1910.136: Foot Protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- Physical state : Solid
- Color : No data available
- Odor : No data available
- Odor threshold : No data available
- pH : No data available
- Melting point : 154.6 °C
- Freezing point : No data available
- Boiling point : No data available
- Flash point : No data available
- Relative evaporation rate (butyl acetate=1) : No data available
- Flammability (solid, gas) : No data available
- Explosion limits : No data available
- Explosive properties : No data available
- Oxidizing properties : No data available
- Vapor pressure : No data available
- Relative density : No data available
- Relative vapor density at 20 °C : No data available
- Molecular mass : 499.15 g/mol

Perfluorooctanesulfonamide

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Solubility	: No data available
Log Pow	: No data available
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Viscosity	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

The product is stable at normal handling and storage conditions.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong oxidizing agents.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Perfluorooctanesulfonamide (754-91-6)	
LD50 oral rat	> 172 mg/kg

Skin corrosion/irritation	: Causes skin irritation.
Serious eye damage/irritation	: Causes serious eye irritation.
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
Specific target organ toxicity (single exposure)	: May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	: Not classified
Aspiration hazard	: Not classified

SECTION 12: Ecological information

12.1. Toxicity

No additional information available

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

No additional information available

Perfluorooctanesulfonamide

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber.
Waste disposal recommendations : Dispose of contents/container in accordance with licensed collector's sorting instructions.
Additional information : Recycle the material as far as possible.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT
Not regulated for transport

TDG

No additional information available

Transport by sea

No additional information available

Air transport

No additional information available

SECTION 15: Regulatory information

15.1. US Federal regulations

Perfluorooctanesulfonamide (754-91-6)

EPA TSCA Regulatory Flag

S - S - indicates a substance that is identified in a proposed or final Significant New Uses Rule.

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory except for:

Perfluorooctanesulfonamide

CAS No 754-91-6

100%

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

No additional information available

EU-Regulations

No additional information available

National regulations

Perfluorooctanesulfonamide (754-91-6)

Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Japanese ISHL (Industrial Safety and Health Law)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

SECTION 16: Other information

Perfluorooctanesulfonamide

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Full text of H-phrases:

Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

NFPA health hazard

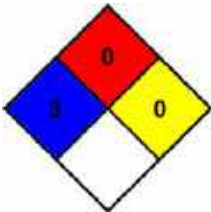
: 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.

NFPA fire hazard

: 0 - Materials that will not burn.

NFPA reactivity

: 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health

: 2 Moderate Hazard - Temporary or minor injury may occur

Flammability

: 0 Minimal Hazard - Materials that will not burn

Physical

: 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable or any damage resulting from handling or from contact with the above product.



SAFETY DATA SHEET

N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

According to Regulation (EC) No 1907/2006, Annex II, as amended. Commission Regulation (EU) No 2015/830 of 28 May 2015.

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name	N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine
Product number	FE91897
CAS number	2991-50-6
EC number	221-061-1

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses	Laboratory reagent. Manufacture of substances. Research and development.
-----------------	--

1.3. Details of the supplier of the safety data sheet

Supplier	Carbosynth Ltd 8&9 Old Station Business Park Compton Berkshire RG20 6NE UK +44 1635 578444 +44 1635 579444 info@carbosynth.com
----------	--

1.4. Emergency telephone number

Emergency telephone	+44 7887 998634
---------------------	-----------------

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (EC 1272/2008)

Physical hazards	Not Classified
Health hazards	Skin Irrit. 2 - H315 Eye Irrit. 2 - H319 STOT SE 3 - H335
Environmental hazards	Not Classified

2.2. Label elements

EC number	221-061-1
-----------	-----------

Hazard pictograms



Signal word	Warning
-------------	---------

N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

Hazard statements	H315 Causes skin irritation. H319 Causes serious eye irritation. H335 May cause respiratory irritation.
Precautionary statements	P264 Wash contaminated skin thoroughly after handling. P280 Wear protective gloves/ protective clothing/ eye protection/ face protection. P302+P352 IF ON SKIN: Wash with plenty of water. P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing. P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

2.3. Other hazards

No data available.

SECTION 3: Composition/information on ingredients

3.1. Substances

Product name	N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine
CAS number	2991-50-6
EC number	221-061-1
Chemical formula	C ₁₂ H ₈ F ₁₇ NO ₄ S

SECTION 4: First aid measures

4.1. Description of first aid measures

General information	Get medical advice/attention if you feel unwell.
Inhalation	Remove person to fresh air and keep comfortable for breathing. If breathing stops, provide artificial respiration. When breathing is difficult, properly trained personnel may assist affected person by administering oxygen. Get medical attention if symptoms are severe or persist.
Ingestion	Do not induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth thoroughly with water. Give plenty of water to drink. Get medical attention if symptoms are severe or persist.
Skin contact	Remove contaminated clothing. Rinse with water. Continue to rinse for at least 15 minutes. Wash contaminated clothing before reuse. Get medical attention if symptoms are severe or persist.
Eye contact	Rinse immediately with plenty of water. Continue to rinse for at least 15 minutes. Get medical attention if symptoms are severe or persist.

4.2. Most important symptoms and effects, both acute and delayed

General information	See Section 11 for additional information on health hazards.
----------------------------	--

4.3. Indication of any immediate medical attention and special treatment needed

Notes for the doctor	Treat symptomatically.
-----------------------------	------------------------

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media	Extinguish with alcohol-resistant foam, carbon dioxide, dry powder or water fog. Use fire-extinguishing media suitable for the surrounding fire.
-------------------------------------	--

5.2. Special hazards arising from the substance or mixture

Specific hazards	None known.
-------------------------	-------------

N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

Hazardous combustion products

Thermal decomposition or combustion products may include the following substances: Harmful gases or vapours. Oxides of carbon. Oxides of nitrogen. Oxides of sulphur. Hydrogen fluoride (HF).

5.3. Advice for firefighters

Special protective equipment for firefighters

Wear positive-pressure self-contained breathing apparatus (SCBA) and appropriate protective clothing. Firefighter's clothing conforming to European standard EN469 (including helmets, protective boots and gloves) will provide a basic level of protection for chemical incidents. Use protective equipment appropriate for surrounding materials.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions

Wear protective clothing as described in Section 8 of this safety data sheet. No action shall be taken without appropriate training or involving any personal risk. Do not touch or walk into spilled material. Avoid inhalation of dust and vapours. Provide adequate ventilation. Keep unnecessary and unprotected personnel away from the spillage.

6.2. Environmental precautions

Environmental precautions

Avoid discharge into drains or watercourses or onto the ground.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up

Wear protective clothing as described in Section 8 of this safety data sheet. Collect powder using special dust vacuum cleaner with particle filter or carefully sweep into suitable waste disposal containers and seal securely. Clear up spills immediately and dispose of waste safely. Flush contaminated area with plenty of water. Wash thoroughly after dealing with a spillage. For waste disposal, see Section 13.

6.4. Reference to other sections

Reference to other sections

For personal protection, see Section 8. See Section 11 for additional information on health hazards. See Section 12 for additional information on ecological hazards. For waste disposal, see Section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Usage precautions

Wear protective clothing as described in Section 8 of this safety data sheet. Wash hands thoroughly after handling. Provide adequate ventilation. Avoid generation and spreading of dust. Avoid contact with skin and eyes. Avoid inhalation of dust and vapours.

7.2. Conditions for safe storage, including any incompatibilities

Storage precautions

Keep container tightly closed. Store in a cool and well-ventilated place. Store contents under inert gas. Store at temperatures between -15°C and -25°C.

7.3. Specific end use(s)

Specific end use(s)

The identified uses for this product are detailed in Section 1.2.

SECTION 8: Exposure controls/Personal protection

8.1. Control parameters

Occupational exposure limits

No exposure limits known for ingredient(s).

8.2. Exposure controls

Appropriate engineering controls

Provide adequate ventilation. Observe any occupational exposure limits for the product or ingredients.

N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

Eye/face protection	Unless the assessment indicates a higher degree of protection is required, the following protection should be worn: Tight-fitting safety glasses. Personal protective equipment for eye and face protection should comply with European Standard EN166.
Hand protection	Wear protective gloves. To protect hands from chemicals, gloves should comply with European Standard EN374.
Other skin and body protection	Wear appropriate clothing to prevent repeated or prolonged skin contact.
Respiratory protection	Respiratory protection complying with an approved standard should be worn if a risk assessment indicates inhalation of contaminants is possible. Ensure all respiratory protective equipment is suitable for its intended use and is 'CE'-marked. Particulate filters should comply with European Standard EN143. Full face mask respirators with replaceable filter cartridges should comply with European Standard EN136. Half mask and quarter mask respirators with replaceable filter cartridges should comply with European Standard EN140.
Environmental exposure controls	Keep container tightly sealed when not in use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	Solid.
Colour	White. to Off-white.
Odour	No data available.
Odour threshold	No data available.
pH	No data available.
Melting point	>69°C
Initial boiling point and range	No data available.
Flash point	No data available.
Evaporation rate	No data available.
Flammability (solid, gas)	No data available.
Upper/lower flammability or explosive limits	No data available.
Vapour pressure	No data available.
Vapour density	No data available.
Relative density	No data available.
Solubility(ies)	Almost insoluble in the following materials: DMSO Methanol.
Partition coefficient	No data available.
Auto-ignition temperature	No data available.
Decomposition Temperature	No data available.
Viscosity	No data available.
Explosive properties	No data available.
Oxidising properties	No data available.

N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

9.2. Other information

Molecular weight 585.24

SECTION 10: Stability and reactivity

10.1. Reactivity

Reactivity No data available.

10.2. Chemical stability

Stability Stable under the prescribed storage conditions.

10.3. Possibility of hazardous reactions

Possibility of hazardous reactions No data available.

10.4. Conditions to avoid

Conditions to avoid No data available.

10.5. Incompatible materials

Materials to avoid Strong oxidising agents.

10.6. Hazardous decomposition products

Hazardous decomposition products Oxides of carbon. Oxides of nitrogen. Oxides of sulphur. Hydrogen fluoride (HF).

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity - oral

Notes (oral LD₅₀) Based on available data the classification criteria are not met.

Acute toxicity - dermal

Notes (dermal LD₅₀) Based on available data the classification criteria are not met.

Acute toxicity - inhalation

Notes (inhalation LC₅₀) Based on available data the classification criteria are not met.

Skin corrosion/irritation

Animal data Irritating.

Serious eye damage/irritation

Serious eye damage/irritation Causes serious eye irritation.

Respiratory sensitisation

Respiratory sensitisation Based on available data the classification criteria are not met.

Skin sensitisation

Skin sensitisation Based on available data the classification criteria are not met.

Germ cell mutagenicity

Genotoxicity - in vitro Based on available data the classification criteria are not met.

Carcinogenicity

Carcinogenicity Based on available data the classification criteria are not met.

IARC carcinogenicity

None of the ingredients are listed or exempt.

Reproductive toxicity

N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

Reproductive toxicity - fertility Based on available data the classification criteria are not met.

Reproductive toxicity - development Based on available data the classification criteria are not met.

Specific target organ toxicity - single exposure

STOT - single exposure STOT SE 3 - H335 May cause respiratory irritation.

Target organs Respiratory system, lungs

Specific target organ toxicity - repeated exposure

STOT - repeated exposure Not classified as a specific target organ toxicant after repeated exposure.

Aspiration hazard

Aspiration hazard Not relevant. Solid.

General information Dust may irritate the eyes and the respiratory system. The severity of the symptoms described will vary dependent on the concentration and the length of exposure.

Inhalation A single exposure may cause the following adverse effects: Irritation of nose, throat and airway. Difficulty in breathing. Coughing.

Ingestion May cause irritation.

Skin contact Redness. Irritating to skin.

Eye contact Irritating to eyes.

Route of exposure Ingestion Inhalation Skin and/or eye contact

Target organs Respiratory system, lungs

N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

SECTION 12: Ecological information

Ecotoxicity Not regarded as dangerous for the environment. However, large or frequent spills may have hazardous effects on the environment.

12.1. Toxicity

Toxicity Based on available data the classification criteria are not met.

12.2. Persistence and degradability

Persistence and degradability The degradability of the product is not known.

12.3. Bioaccumulative potential

Bioaccumulative potential No data available on bioaccumulation.

Partition coefficient No data available.

12.4. Mobility in soil

Mobility No data available.

12.5. Results of PBT and vPvB assessment

Results of PBT and vPvB assessment No data available.

12.6. Other adverse effects

Other adverse effects None known.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

General information Dispose of waste to licensed waste disposal site in accordance with the requirements of the local Waste Disposal Authority. This material and its container must be disposed of in a safe way. When handling waste, the safety precautions applying to handling of the product should be considered.

SECTION 14: Transport information

General The product is not covered by international regulations on the transport of dangerous goods (IMDG, IATA, ADR/RID).

14.1. UN number

Not applicable.

14.2. UN proper shipping name

Not applicable.

14.3. Transport hazard class(es)

No transport warning sign required.

14.4. Packing group

Not applicable.

14.5. Environmental hazards

Environmentally hazardous substance/marine pollutant
No.

14.6. Special precautions for user

N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

Not applicable.

14.7. Transport in bulk according to Annex II of MARPOL and the IBC Code

Transport in bulk according to Not applicable.

Annex II of MARPOL 73/78
and the IBC Code

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations	Health and Safety at Work etc. Act 1974 (as amended). The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (SI 2009 No. 1348) (as amended) ["CDG 2009"]. EH40/2005 Workplace exposure limits.
EU legislation	Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (as amended). Commission Regulation (EU) No 2015/830 of 28 May 2015. Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures (as amended).

15.2. Chemical safety assessment

No chemical safety assessment has been carried out.

SECTION 16: Other information

Abbreviations and acronyms used in the safety data sheet	ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road. ADN: European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways. RID: European Agreement concerning the International Carriage of Dangerous Goods by Rail. IATA: International Air Transport Association. ICAO: Technical Instructions for the Safe Transport of Dangerous Goods by Air. IMDG: International Maritime Dangerous Goods. CAS: Chemical Abstracts Service. ATE: Acute Toxicity Estimate. LC ₅₀ : Lethal Concentration to 50 % of a test population. LD ₅₀ : Lethal Dose to 50% of a test population (Median Lethal Dose). EC ₅₀ : 50% of maximal Effective Concentration. PBT: Persistent, Bioaccumulative and Toxic substance. vPvB: Very Persistent and Very Bioaccumulative.
Training advice	Only trained personnel should use this material.
Revision date	25/05/2020
Revision	1
Hazard statements in full	H315 Causes skin irritation. H319 Causes serious eye irritation. H335 May cause respiratory irritation.

This 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. Such information is, to the best of the company's knowledge and belief, accurate and reliable as of the date indicated. However, no warranty, guarantee or representation is made to its accuracy, reliability or completeness. It is the user's responsibility to satisfy himself as to the suitability of such information for his own particular use.



1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product Identifier

Chemical Name N-Methylperfluoro-1-octanesulfonamidoacetic Acid

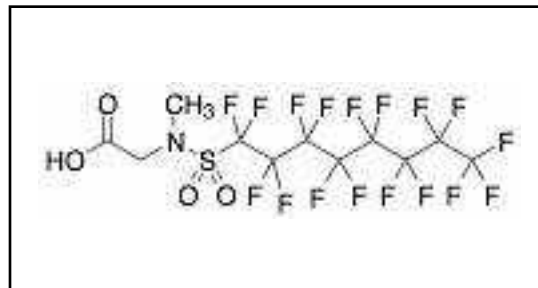
Catalogue # M320055

1.2 Relevant Identified Uses of the Substance or Mixture and Uses Advised Against

Product Uses To be used only for scientific research and development. Not for use in humans or animals.

1.3 Details of the Supplier of the Safety Data Sheet

Company Toronto Research Chemicals
2 Brisbane Road
Toronto, ON M3J 2J8
CANADA
Telephone +14166659696
FAX +14166654439
Email orders@trc-canada.com



1.4 Emergency Telephone Number

Emergency# +1(416) 665-9696 between 0800-1700 (GMT-5)

2. HAZARDS IDENTIFICATION

2.1/2.2 Classification of the Substance or Mixture and Label Elements

GHS Hazards Classification (According to EU Regulation 1272/2008 and US OSHA 1910.1200)

Hazardous to the Aquatic Environment, Long-Term Hazard (Category 4)

GHS Hazards Identification (According to EU Regulation 1272/2008 and US OSHA 1910.1200)

Signal Word

GHS Hazard Statements

H413 May cause long lasting harmful effects to aquatic life.

GHS Precautionary Statements

P273 Avoid release to the environment.

2.3 Unclassified Hazards/Hazards Not Otherwise Classified

No data available.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Molecular Formula: $C_{11}H_6F_{17}NO_4S$

Molecular Weight: 571.21

CAS Registry #: 2355-31-9

EC#:

Synonyms

N-[(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-Heptafluorooctyl)sulfonyl]-N-methylglycine;
2-(N-Methyl-perfluorooctane sulfonamido) Acetate;
2-(N-Methylperfluorooctanesulfoamido)acetic Acid;
2-(N-Methylperfluorooctanesulfonamido)acetic Acid;
Me-PFOSA-AcOH;
N-Me-PFOSAA; N-[(heptafluorooctyl)sulfonyl]-sarcosine; N-[(heptafluorooctyl)sulfonyl]-N-methyl-glycine

3.2 Mixtures

Not a mixture.

4. FIRST AID MEASURES

4.1 Description of First Aid Measures

General Advice

If medical attention is required, show this safety data sheet to the doctor.

If Inhaled

If inhaled, move person to fresh air. If not breathing, give artificial respiration and consult a physician.

In Case of Skin Contact

Wash affected area with soap and water. Consult a physician if any exposure symptoms are observed.

In Case of Eye Contact

Immediately rinse eyes with plenty of water for at least 15 minutes. Consult a physician.

If Swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Do NOT induce vomiting unless advised to do so by a physician or Poison Control Center. Seek medical attention.

4.2 Most Important Symptoms and Effects, Both Acute and Delayed

The most important known symptoms and effects are described in the labeling (see section 2.2) and/or section 11.

4.3 Indication of any Immediate Medical Attention and Special Treatment Needed

No data available.

5. FIREFIGHTING MEASURES

5.1 Extinguishing Media

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

5.2 Special Hazards Arising from the Substance or Mixture

Carbon oxides, Nitrogen oxides, Sulfur oxides, Hydrogen fluoride

5.3 Advice for Firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further Information

No data available.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Method and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed.

7.2 Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place. Keep in a dry place.

Storage conditions: -20°C Freezer, Under inert atmosphere

7.3 Specific End Uses

For scientific research and development only. Not for use in humans or animals.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control Parameters

Contains no components with established occupational exposure limits.

8.2 Exposure Controls

Appropriate Engineering Controls

A laboratory fumehood or other appropriate form of local exhaust ventilation should be used to avoid exposure.

Personal Protective Equipment

All recommendations below are advisory in nature and a risk assessment should be performed by the employer/end user prior to use of this product. The type of protective equipment must be selected based on the amount and concentration of the dangerous material being used in the workplace.

Eye/Face Protection

Safety goggles or face shield. All equipment should have been tested and approved under appropriate standards, such as NIOSH (US), CSA (Canada), or EN 166 (EU).

Skin Protection

Gloves should be used when handling this material. Gloves are to be inspected prior to use. Contaminated gloves are to be removed using proper glove removal technique so that the outer surface of the glove does not contact bare skin. Dispose of contaminated gloves after use in compliance with good laboratory practices and local requirements.

Gloves used for incidental exposures (splash protection) should be designated as "chemical resistant" by EU standard EN 374 with the resistance codes corresponding to the anticipated use of the material. Unrated gloves are not recommended.

Suggested gloves: AnsellPro Sol-Vex nitrile gloves style 37-175, 15 mil thickness.

Penetration time has not been determined.

Gloves used for prolonged direct exposure (immersion) should be designated "chemical resistant" as per EN 374 with the resistance codes corresponding to the anticipated use of the material.

Suggested gloves: AnsellPro Viton/Butyl gloves style 38-612, 4/8 mil thickness.

Penetration time has not been determined.

These recommendations may not apply if the material is mixed with any other chemical, or dissolved into a solution. A risk assessment must be performed to ensure the gloves will still offer acceptable protection.

Body Protection

Fire resistant (Nomex) lab coat or coveralls.

Respiratory Protection

Recommended respirators are NIOSH-approved N100 or CEN-approved FFP3 particulate respirators. These are to be only used as a backup to local exhaust ventilation or other engineering controls. If the respirator is the only means of protection, a full-face supplied air respirator must be used.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on Basic Physical and Chemical Properties

A) Appearance

White to Off-White Solid

C) Odour Threshold

No data available

E) Melting Point/Freezing Point

142 - 144°C

G) Flash point

No data available

I) Flammability (Solid/Gas)

No data available

K) Vapour Pressure

No data available

M) Relative Density

No data available

O) Partition Coefficient: n-octanol/water

B) Odour

No data available

D) pH

No data available

F) Initial Boiling Point/Boiling Range

No data available

H) Evaporation Rate

No data available

J) Upper/Lower Flammability/Explosive Limits

No data available

L) Vapour Density

No data available

N) Solubility

DMSO (Slightly), Methanol (Slightly)

P) Auto-Ignition Temperature

No data available

Q) Decomposition Temperature

No data available

S) Explosive Properties

No data available

No data available

R) Viscosity

No data available

T) Oxidizing Properties

No data available

9.2 Other Information

no data available

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available.

10.2 Chemical Stability

Stable under recommended storage conditions.

10.3 Possibility of Hazardous Reactions

No data available.

10.4 Conditions to Avoid

No data available.

10.5 Incompatible Materials

Strong oxidizing agents.

10.6 Hazardous Decomposition Products

In the event of fire: See section 5. Other decomposition products: No data available.

11. TOXICOLOGICAL INFORMATION

11.1 Information on Toxicological Effects

A) Acute Toxicity

Oral LD50: No data available.

Inhalation LC50: No data available.

Dermal LD50: No data available.

B) Skin Corrosion/Irritation

No data available

C) Serious Eye Damage/Irritation

No data available

D) Respiratory or Skin Sensitization

No data available

E) Germ Cell Mutagenicity

No data available

F) Carcinogenicity

No data available

G) Reproductive Toxicity/Teratogenicity

No data available

H) Single Target Organ Toxicity - Single Exposure

No data available

I) Single Target Organ Toxicity - Repeated Exposure

No data available

J) Aspiration Hazard

No data available

K) Potential Health Effects and Routes of Exposure

Inhalation

May be harmful if inhaled. May cause respiratory tract irritation.

Ingestion

May be harmful if swallowed.

Skin

May be harmful if absorbed through skin. May cause skin irritation.

Eyes

May cause eye irritation.

L) Signs and Symptoms of Exposure

The most important known symptoms and effects are described in the labeling (see section 2.2) and/or section 11.

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

M) Additional Information

RTECS: Not available.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available.

12.2 Persistence and Degradability

No data available.

12.3 Bioaccumulative Potential

No data available.

12.4 Mobility in Soil

No data available.

12.5 Results of PBT and vPvB Assessment

No data available.

12.6 Other Adverse Effects

No data available.

13. DISPOSAL CONSIDERATIONS

13.1 Waste Treatment Methods

A) Product

Product may be burned in an incinerator equipped with afterburner and scrubber. Excess and expired materials are to be offered to a licensed hazardous material disposal company. Ensure that all Federal and Local regulations regarding the disposal and destruction of this material are followed.

B) Contaminated Packaging

Dispose of as above.

C) Other Considerations

Product is not to be disposed of in sanitary sewers, storm sewers, or landfills.

14. TRANSPORT INFORMATION

14.1 UN Number

DOT (US): N/A

IATA: N/A

IMDG: N/A

ADR/RID: N/A

14.2 UN Proper Shipping Name

DOT (US)/IATA:

Not dangerous goods

IMDG/ARD/RID:

Not dangerous goods

14.3 Transport Hazard Class(es)

DOT (US): N/A

IATA: N/A

IMDG: N/A

ADR/RID: N/A

14.4 Packing Group

DOT (US): N/A

IATA: N/A

IMDG: N/A

ADR/RID: N/A

14.5 Environmental Hazards

DOT (US): None

IATA: None

IMDG: None

ADR/RID: None

14.6 Special Precautions for User

None

15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of WHMIS (Canada), OSHA 1910.1200 (US), and EU Regulation EC No. 1907/2006 (European Union).

15.1 Safety, Health and Environmental Regulations/Legislation Specific for the Substance or Mixture

A) Canada

DSL/NDSL Status: This product is not listed on the Canadian DSL/NDSL.

B) United States

TSCA Status: This product is not listed on the US EPA TSCA.

C) European Union

ECHA Status: This product is not registered with the EU ECHA.

15.2 Chemical Safety Assessment

No data available

16. OTHER INFORMATION

16.1 Revision History

Original Publication Date: 8/1/2019

16.2 List of Abbreviations

LD50	Median lethal dose of a substance required to kill 50% of a test population.
LC50	Medial lethal concentration of a substance required to kill 50% of a test population.
LDLo	Lowest known lethal dose
TDLo	Lowest known toxic dose
IARC	International Agency for Research on Cancer
NTP	National Toxicology Program
RTECS	Registry of Toxic Effects of Chemical Substances

16.3 Further Information

Copyright 2015. Toronto Research Chemicals Inc. Copies may be made for internal use only. The above information is believed to be correct to the best of our knowledge, but is to be only used as a guide. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Please take all due care when handling this product.



TCI AMERICA

SAFETY DATA SHEET

Revision number: 3
Revision date: 08/15/2016

1. IDENTIFICATION

Product name: Nonafluoro-1-butanesulfonic Acid
Product code: N0709

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborside Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Acute Toxicity - Oral [Category 4]
Eye Damage/Irritation [Category 1]
Corrosive to Metals [Category 1]
Skin Corrosion/Irritation [Category 1C]

Signal word: Danger!

Hazard Statement(s):
Causes serious eye damage
Causes severe skin burns and eye damage
Harmful if swallowed
May be corrosive to metals

Pictogram(s) or Symbol(s):



Precautionary Statement(s):
[Prevention]

Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves, protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full length face shield). Keep only in original container.

[Response]

If swallowed: Immediately call a poison center or doctor. Rinse mouth. If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Absorb spillage to prevent material damage.

[Storage]

Store locked up. Store in corrosive resistant container with a resistant inner liner.

[Disposal]

Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture:	Substance
Components:	Nonafluoro-1-butanesulfonic Acid
Percent:	>98.0%(T)
CAS Number:	375-73-5
Molecular Weight:	300.09
Chemical Formula:	C ₄ HF ₉ O ₃ S
Synonyms:	Perfluoro-1-butanesulfonic Acid

4. FIRST-AID MEASURES

Inhalation:	Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Skin contact:	For severe burns, immediate medical attention is required. Immediately call a poison center or doctor. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Eye contact:	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Ingestion:	Harmful if swallowed. Do not induce vomiting with out medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Symptoms/effects:	
Acute:	Pain. Redness.
Delayed:	No data available
Immediate medical attention:	WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is harmful. WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media:	Dry chemical, CO ₂ or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.
--------------------------------------	---

Specific hazards arising from the chemical

Hazardous combustion products:	These products include: Carbon oxides Sulfur oxides Halogenated compounds
Other specific hazards:	WARNING: Highly toxic HF gas is produced during combustion.

Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
------------------------------	--

6. ACCIDENTAL RELEASE MEASURES

Personal protective equipment:	Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).
Emergency procedures:	In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and exercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Ventilate the area.

Environmental precautions:

Keep away from living quarters. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling:	Do NOT breathe gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Do not ingest. Avoid contact with skin and eyes. May corrode metallic surfaces. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.
Conditions for safe storage:	Store in corrosive resistant container with a resistant inner liner. Keep containers tightly closed in a cool, well-ventilated place. Store locked up. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods. Store under inert gas (e.g. Argon). Hygroscopic material, store in a tightly sealed container.
Storage incompatibilities:	Acids, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits:	No data available
-------------------------	-------------------

Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection:	Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection:	Nitrile gloves.
Eye protection:	Wear eye protection (splash goggles) and face protection (full length face shield).
Skin and body protection:	Wear protective clothing (lab coat and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C):	Liquid		
Form:	Clear		
Color:	Colorless - Very pale yellow		
Odor:	No data available		
Odor threshold:	No data available		
Melting point/freezing point:	No data available	pH:	No data available
Boiling point/range:	212°C (414°F)	Vapor pressure:	No data available
Decomposition temperature:	No data available	Vapor density:	No data available
Relative density:	No data available	Dynamic Viscosity:	No data available
Kinematic Viscosity:	No data available		
Partition coefficient:	No data available	Evaporation rate:	No data available
n-octanol/water (log P_{ow})		(Butyl Acetate = 1)	
Flash point:	No data available	Autoignition temperature:	No data available
Flammability (solid, gas):	No data available	Flammability or explosive limits:	
		Lower:	No data available
		Upper:	No data available
Solubility(ies):			
Water:	Soluble		
Soluble:	Acetonitrile		

9. PHYSICAL AND CHEMICAL PROPERTIES

Very slightly soluble: Toluene, Heptane

10. STABILITY AND REACTIVITY

Reactivity:	Corrodes in contact with metals.
Chemical Stability:	Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions:	No hazardous reactivity has been reported.
Conditions to avoid:	Avoid excessive heat and light.
Incompatible materials:	Oxidizing agents
Hazardous Decomposition Products:	No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: EK5930000

Acute Toxicity:

ori-rat LD50:430 mg/kg

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available**NTP:** No data available**OSHA:** No data available**Reproductive toxicity:**

No data available

Routes of Exposure:

Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Overexposure may result in serious illness or death. Skin contact may produce burns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.

Potential Health Effects:

No specific information available; skin and eye contact may result in irritation. May be harmful if inhaled or ingested.

Target organ(s):

No data available

12. ECOLOGICAL INFORMATION**Ecotoxicity**

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

Persistence and degradability:

No data available

Bioaccumulative potential (BCF):

No data available

Mobility in soil:

No data available

Partition coefficient:

No data available

n-octanol/water (log P_{ow})**Soil adsorption (K_{oc}):**

No data available

Henry's Law:

No data available

constant (PaM³/mol)

13. DISPOSAL CONSIDERATIONS

Disposal of product:	Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container:	Dispose of as unused product. Do not re-use empty containers.
Other considerations:	Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)			
UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2586	Alkyl sulfonic acids, liquid	8 Corrosive material	III
IATA			
UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2586	Alkylsulfonic acids, liquid	8 Corrosive material	III
IMDG			
UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2586	Alkylsulphonic acids, liquid	8 Corrosive material	III

EmS number: F-A, S-B

15. REGULATORY INFORMATION**Toxic Substance Control Act (TSCA 8b.):**

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations**CERCLA Hazardous substance and Reportable Quantity:**

SARA 313:	Not Listed
SARA 302:	Not Listed

State Regulations**State Right-to-Know**

Massachusetts	Not Listed
New Jersey	Not Listed
Pennsylvania	Not Listed
California Proposition 65:	Not Listed

Other Information**NFPA Rating:**

Health:	3
Flammability:	0
Instability:	0

HMIS Classification:

Health:	3
Flammability:	0
Physical:	0

International Inventories**WHMIS hazard class:**

E: Corrosive material.
D2A: Materials causing other toxic effects. (Very Toxic)

Canada: NDSL

On NDSL

EC-No:

206-793-1

16. OTHER INFORMATION

Revision date: 08/15/2016

Revision number: 3

16. OTHER INFORMATION

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.



TCI AMERICA

SAFETY DATA SHEET

Revision number: 3
Revision date: 08/18/2015

1. IDENTIFICATION

Product name: Heptafluorobutyric Acid (ca. 0.5mol/L in Water) [Ion-Pair Reagent for LC-MS]
Product code: A5713

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborside Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Eye Damage/Irritation [Category 1]
Corrosive to Metals [Category 1]
Skin Corrosion/Irritation [Category 1B]

Signal word: Danger!

Hazard Statement(s): Causes serious eye damage
Causes severe skin burns and eye damage
May be corrosive to metals

Pictogram(s) or Symbol(s):



Precautionary Statement(s):
[Prevention]

Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves, protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full length face shield). Keep only in original container.

[Response]

If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Absorb spillage to prevent material damage.

[Storage]

Store locked up. Store in corrosive resistant container with a resistant inner liner.

[Disposal]

Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Mixture

3. COMPOSITION/INFORMATION ON INGREDIENTS

Components:	Heptafluorobutyric Acid (ca. 0.5mol/L in Water) [Ion-Pair Reagent for LC-MS]
Percent:
CAS Number:	375-22-4
Molecular Weight:	214.04
Chemical Formula:	C ₄ HF ₇ O ₂
Synonyms:	IPC-PFFA-4 (ca. 0.5mol/L in Water) , Perfluorobutyric Acid (ca. 0.5mol/L in Water)

4. FIRST-AID MEASURES

Inhalation:	Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Skin contact:	For severe burns, immediate medical attention is required. Immediately call a poison center or doctor. Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Eye contact:	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Ingestion:	Do not induce vomiting without medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Symptoms/effects:	
Acute:	Pain. Redness.
Delayed:	No data available
Immediate medical attention:	WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media:	Dry chemical, CO ₂ or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.
-------------------------------	---

Specific hazards arising from the chemical

Hazardous combustion products:	These products include: Carbon oxides Halogenated compounds
Other specific hazards:	WARNING: Highly toxic HF gas is produced during combustion.

Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
Personal protective equipment:	Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures: In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and exercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Ventilate the area.

Environmental precautions:

Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breathe gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Avoid contact with skin and eyes. May corrode metallic surfaces. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store in corrosive resistant container with a resistant inner liner. Keep containers tightly closed in a cool, well-ventilated place. Store locked up. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Bases, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection: Nitrile gloves.

Eye protection: Wear eye protection (splash goggles) and face protection (full length face shield).

Skin and body protection: Wear protective clothing (lab coat and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid
Form: Clear
Color: Colorless
Odor: No data available
Odor threshold: No data available

Melting point/freezing point: No data available
Boiling point/range: No data available
Decomposition temperature: No data available
Relative density: No data available
Kinematic Viscosity: No data available
Partition coefficient: No data available
n-octanol/water (log P_{ow})

Flash point: No data available
Flammability (solid, gas): No data available

Solubility(ies):

pH: No data available
Vapor pressure: No data available
Vapor density: No data available
Dynamic Viscosity: No data available

Evaporation rate: No data available
(Butyl Acetate = 1)

Autoignition temperature: No data available

Flammability or explosive limits:
Lower: No data available
Upper: No data available

10. STABILITY AND REACTIVITY

Reactivity: Corrodes in contact with metals.
Chemical Stability: Stable under recommended storage conditions. (See Section 7)

10. STABILITY AND REACTIVITY

Possibility of Hazardous Reactions:	No hazardous reactivity has been reported.
Conditions to avoid:	Avoid excessive heat and light.
Incompatible materials:	Oxidizing agents
Hazardous Decomposition Products:	No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: ET4025000

Acute Toxicity:

ipr-mus LD50:68 uL/kg

ivn-rbt LD:>10 uL/kg

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available

NTP: No data available

OSHA: No data available

Reproductive toxicity:

No data available

Routes of Exposure:

Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Skin contact may produce burrns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.

Potential Health Effects:

No specific information available; skin and eye contact may result in irriatation. May be harmful if inhaled or ingested.

Target organ(s):

No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

Persistence and degradability:

No data available

Bioaccumulative potential (BCF):

No data available

Mobility in soil:

No data available

Partition coefficient:

No data available

n-octanol/water (log P_{ow})

Soil adsorption (K_{oc}):

No data available

Henry's Law:

No data available

constant (PaM³/mol)

13. DISPOSAL CONSIDERATIONS

Disposal of product:	Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container:	Dispose of as unused product. Do not re-use empty containers.
Other considerations:	Observe all federal, state and local regulations when disposing of the substance.

DOT (US)

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3265	Corrosive liquid, acidic, organic, n.o.s.	8 Corrosive material	II

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3265	Corrosive liquid, acidic, organic, n.o.s.	8 Corrosive material	II

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3265	Corrosive liquid, acidic, organic, n.o.s.	8 Corrosive material	II

EmS number: F-A, S-B

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313:	Not Listed
SARA 302:	Not Listed

State Regulations

State Right-to-Know

Massachusetts	Not Listed
New Jersey	Not Listed
Pennsylvania	Not Listed
California Proposition 65:	Not Listed

Other Information

NFPA Rating:

Health:	3
Flammability:	0
Instability:	0

HMIS Classification:

Health:	3
Flammability:	0
Physical:	0

International Inventories

WHMIS hazard class:	E: Corrosive material.
EC-No:	206-786-3

16. OTHER INFORMATION

Revision date: 08/18/2015

Revision number: 3

16. OTHER INFORMATION

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.



TCI AMERICA

SAFETY DATA SHEET

Page 1 of 6

Revision number: 3
Revision date: 10/17/2016

1. IDENTIFICATION

Product name: Nonadecafluorodecanoic Acid
Product code: N0607

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborside Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Acute Toxicity - Oral [Category 3]
Eye Damage/Irritation [Category 1]
Skin Corrosion/Irritation [Category 1B]

Signal word: Danger!

Hazard Statement(s): Causes serious eye damage
Causes severe skin burns and eye damage
Toxic if swallowed

Pictogram(s) or Symbol(s):



Precautionary Statement(s):
[Prevention]

Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves, protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full length face shield).

[Response]

If swallowed: Immediately call a poison center or doctor. Rinse mouth. If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

[Storage]

Store locked up.

[Disposal]

Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture:	Substance
Components:	Nonadecafluorodecanoic Acid
Percent:	>98.0%(T)
CAS Number:	335-76-2
Molecular Weight:	514.09
Chemical Formula:	C ₁₀ HF ₁₉ O ₂
Synonyms:	Perfluorodecanoic Acid

4. FIRST-AID MEASURES

Inhalation:	Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Skin contact:	For severe burns, immediate medical attention is required. Immediately call a poison center or doctor. Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Eye contact:	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Ingestion:	Toxic if swallowed. Do not induce vomiting with out medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Symptoms/effects:	
Acute:	Pain. Redness.
Delayed:	No data available
Immediate medical attention:	WARNING: It might be dangerous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is toxic. WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media:	Dry chemical, CO ₂ or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.
--------------------------------------	---

Specific hazards arising from the chemical

Hazardous combustion products:	These products include: Carbon oxides Halogenated compounds
Other specific hazards:	WARNING: Highly toxic HF gas is produced during combustion.

Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
Personal protective equipment:	Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures: Prevent dust cloud. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and exercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material.

Environmental precautions:

Keep away from living quarters. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid inhalation of vapor or mist. Manipulate under an adequate fume hood. Do not ingest. Avoid contact with skin and eyes. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Combustible substances, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection: Nitrile gloves.

Eye protection: Safety glasses.

Skin and body protection: Wear protective clothing (lab coat and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Solid

Form: Crystal - Powder

Color: White - Almost white

Odor: No data available

Odor threshold: No data available

Melting point/freezing point: 88°C (190°F)

Boiling point/range: 145°C (293°F)/13kPa

Decomposition temperature: No data available

Relative density: No data available

Kinematic Viscosity: No data available

Partition coefficient: No data available

n-octanol/water (log P_{ow})

Flash point: No data available

Flammability (solid, gas): No data available

pH: No data available

Vapor pressure: <1.3kPa/0°C

Vapor density: No data available

Dynamic Viscosity: No data available

Evaporation rate: No data available

(Butyl Acetate = 1)

Autoignition temperature: No data available

Flammability or explosive limits:

Lower: No data available

Upper: No data available

Solubility(ies):

10. STABILITY AND REACTIVITY

Reactivity: Not Available.

Chemical Stability: Stable under recommended storage conditions. (See Section 7)

Possibility of Hazardous Reactions: No hazardous reactivity has been reported.

10. STABILITY AND REACTIVITY

Conditions to avoid:	Avoid excessive heat and light.
Incompatible materials:	Alkali, Bases, Oxidizing agents, Reducing agents
Hazardous Decomposition Products:	No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: HD9900000

Acute Toxicity:

ipr-mus LD50:150 mg/kg

ipr-rat LD50:40 mg/kg

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available**NTP:** No data available**OSHA:** No data available**Reproductive toxicity:**

No data available

Routes of Exposure:

Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Overexposure may result in serious illness or death. Skin contact may produce burns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.

Potential Health Effects:

No specific information available; skin and eye contact may result in irritation. May be harmful if inhaled or ingested.

Target organ(s):

No data available

12. ECOLOGICAL INFORMATION**Ecotoxicity**

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

Persistence and degradability:

No data available

Bioaccumulative potential (BCF):

No data available

Mobility in soil:

No data available

Partition coefficient:

No data available

n-octanol/water (log P_{ow})**Soil adsorption (K_{oc}):**

No data available

Henry's Law:

No data available

constant (PaM³/mol)**13. DISPOSAL CONSIDERATIONS****Disposal of product:**

Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.

13. DISPOSAL CONSIDERATIONS

Disposal of container: Dispose of as unused product. Do not re-use empty containers.
Other considerations: Observe all federal, state and local regulations when disposing of the substance.

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

UN number: UN2923	Proper Shipping Name: Corrosive solids, toxic, n.o.s.	Class or Division: 8 Corrosive material	Subrisk(s): 6.1 Toxic material.	Packing Group: II
-----------------------------	---	---	---	-----------------------------

IATA

UN number: UN2923	Proper Shipping Name: Corrosive solid, toxic, n.o.s.	Class or Division: 8 Corrosive material	Subrisk(s): 6.1 Toxic material.	Packing Group: II
-----------------------------	--	---	---	-----------------------------

IMDG

UN number: UN2923	Proper Shipping Name: Corrosive solid, toxic, n.o.s.	Class or Division: 8 Corrosive material	Subrisk(s): 6.1 Toxic material.	Packing Group: II
-----------------------------	--	---	---	-----------------------------

EmS number: F-A, S-B

15. REGULATORY INFORMATION**Toxic Substance Control Act (TSCA 8b.):**

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations**CERCLA Hazardous substance and Reportable Quantity:**

SARA 313:	Not Listed
SARA 302:	Not Listed

State Regulations**State Right-to-Know**

Massachusetts	Not Listed
New Jersey	Not Listed
Pennsylvania	Not Listed
California Proposition 65:	Not Listed

Other Information**NFPA Rating:**

Health:	2
Flammability:	0
Instability:	0

HMIS Classification:

Health:	2
Flammability:	0
Physical:	0

International Inventories

WHMIS hazard class: E: Corrosive material.
D1B: Materials causing immediate and serious toxic effects. (Toxic)

EC-No: 206-400-3

16. OTHER INFORMATION

Revision date: 10/17/2016

Revision number: 3

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.



TCI AMERICA

SAFETY DATA SHEET

Revision number: 3
Revision date: 10/06/2014

1. IDENTIFICATION

Product name: Tricosafluorododecanoic Acid
Product code: T2492

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborage Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Eye Damage/Irritation [Category 1]
Corrosive to Metals [Category 1]
Aquatic Hazard (Acute) [Category 3]
Aquatic Hazard (Long-Term) [Category 3]
Skin Corrosion/Irritation [Category 1B]

Signal word: Danger!

Hazard Statement(s):
Causes serious eye damage
Causes severe skin burns and eye damage
May be corrosive to metals
Harmful to aquatic life
Harmful to aquatic life with long lasting effects

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

[Prevention]

Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves, protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full length face shield). Keep only in original container.

[Response]

If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Absorb spillage to prevent material damage.

[Storage]

Store locked up. Store in corrosive resistant container with a resistant inner liner.

[Disposal]

Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture:	Substance
Components:	Tricosafuorododecanoic Acid
Percent:	>92.0%(GC)
CAS Number:	307-55-1
Molecular Weight:	614.10
Chemical Formula:	C ₁₂ HF ₂₃ O ₂
Synonyms:	Perfluorododecanoic Acid , Tricosafuorolauric Acid , Perfluorolauric Acid

4. FIRST-AID MEASURES

Inhalation:	Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Skin contact:	For severe burns, immediate medical attention is required. Immediately call a poison center or doctor. Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Eye contact:	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Ingestion:	Do not induce vomiting without medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Symptoms/effects:	
Acute:	Pain. Redness.
Delayed:	No data available
Immediate medical attention:	WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media:	Dry chemical, CO ₂ or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.
--------------------------------------	---

Specific hazards arising from the chemical

Hazardous combustion products: These products include: Carbon oxides Halogenated compounds

Other specific hazards: WARNING: Highly toxic HF gas is produced during combustion.

Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
Personal protective equipment:	Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures: Prevent dust cloud. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and exercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material. Ventilate the area.

Environmental precautions:

Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid inhalation of vapor or mist. Manipulate under an adequate fume hood. Avoid contact with skin and eyes. May corrode metallic surfaces. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store in corrosive resistant container with a resistant inner liner. Keep containers tightly closed in a cool, well-ventilated place. Store locked up. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Bases, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection: Wear protective gloves.

Eye protection: Safety glasses.

Skin and body protection: Lab coat.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Solid

Form: Crystal - Powder

Color: White - Almost white

Odor: No data available

Odor threshold: No data available

Melting point/freezing point: 110°C (230°F)

Boiling point/range: 245°C (473°F)

Decomposition temperature: No data available

Relative density: No data available

Kinematic Viscosity: No data available

Partition coefficient: 10.16

n-octanol/water (log P_{ow})

pH: No data available

Vapor pressure: No data available

Vapor density: No data available

Dynamic Viscosity: No data available

Evaporation rate: No data available

(Butyl Acetate = 1)

Flash point: No data available

Flammability (solid, gas): No data available

Autoignition temperature: No data available

Flammability or explosive limits:

Lower: No data available

Upper: No data available

Solubility(ies):

Water: Insoluble

Soluble: Methanol

10. STABILITY AND REACTIVITY

10. STABILITY AND REACTIVITY

Reactivity:	Corrodes in contact with metals.
Chemical Stability:	Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions:	No hazardous reactivity has been reported.
Conditions to avoid:	Avoid excessive heat and light.
Incompatible materials:	Alkali, Bases, Oxidizing agents
Hazardous Decomposition Products:	No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: JR3740000

Acute Toxicity:
No data available

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:

No data available

IARC: No data available

NTP: No data available

OSHA: No data available

Reproductive toxicity:
ori-rat TDLo:22 mg/kg(110D male)

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:
Skin contact may produce burrns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.

Potential Health Effects:
No specific information available; skin and eye contact may result in irritation. May be harmful if inhaled or ingested.

Target organ(s): No data available

12. ECOLOGICAL INFORMATION**Ecotoxicity**

Fish:	96h LC50:>0.500 mg/L (<i>Oryzias latipes</i>)
Crustacea:	48h EC50:0.129 mM (<i>Daphnia magna</i>)
Algae:	No data available

Persistence and degradability:	-16 - -11 % (by BOD), 1 - 2 % (by HPLC)
Bioaccumulative potential (BCF):	16000 (conc. 1 ug/L), 10000 (conc. 0.1 ug/L)
Mobility in soil:	No data available
Partition coefficient:	10.16
n-octanol/water (log P_{ow})	
Soil adsorption (K_{oc}):	No data available
Henry's Law:	7 x 10 ⁶
constant (PaM³/mol)	

13. DISPOSAL CONSIDERATIONS

Disposal of product:	Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container:	Dispose of as unused product. Do not re-use empty containers.
Other considerations:	Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)			
UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3261	Corrosive solid, acidic, organic, n.o.s.	8 Corrosive material	II
IATA			
UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3261	Corrosive solid, acidic, organic, n.o.s.	8 Corrosive material	II
IMDG			
UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3261	Corrosive solid, acidic, organic, n.o.s.	8 Corrosive material	II

EmS number: F-A, S-B

15. REGULATORY INFORMATION**Toxic Substance Control Act (TSCA 8b.):**

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations**CERCLA Hazardous substance and Reportable Quantity:**

SARA 313:	Not Listed
SARA 302:	Not Listed

State Regulations**State Right-to-Know**

Massachusetts	Not Listed
New Jersey	Not Listed
Pennsylvania	Not Listed
California Proposition 65:	Not Listed

Other Information**NFPA Rating:**

Health:	2
Flammability:	0
Instability:	0

HMIS Classification:

Health:	2
Flammability:	0
Physical:	0

International Inventories

WHMIS hazard class:	E: Corrosive material.
EC-No:	206-203-2

16. OTHER INFORMATION

Revision date: 10/06/2014

Revision number: 3

16. OTHER INFORMATION

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.



1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product Identifier

Chemical Name Perfluorodecane Sulfonic Acid

Catalogue # P286540

1.2 Relevant Identified Uses of the Substance or Mixture and Uses Advised Against

Product Uses To be used only for scientific research and development. Not for use in humans or animals.

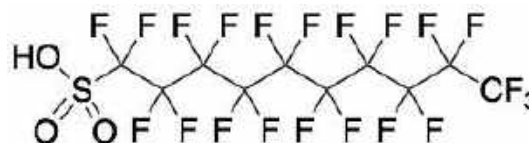
1.3 Details of the Supplier of the Safety Data Sheet

Company Toronto Research Chemicals
2 Brisbane Road
Toronto, ON M3J 2J8
CANADA

Telephone +14166659696

FAX +14166654439

Email orders@trc-canada.com



1.4 Emergency Telephone Number

Emergency# +1(416) 665-9696 between 0800-1700 (GMT-5)

2. HAZARDS IDENTIFICATION

2.1/2.2 Classification of the Substance or Mixture and Label Elements

GHS Hazards Classification (According to EU Regulation 1272/2008 and US OSHA 1910.1200)

Skin Irritation (Category 2)

Eye Damage/Irritation (Category 2A)

Specific Target Organ Toxicity, Single Exposure; Respiratory Tract Irritation (Category 3)

GHS Hazards Identification (According to EU Regulation 1272/2008 and US OSHA 1910.1200)

Signal Word Warning



GHS Hazard Statements

H315 Causes skin irritation.

H319 Causes serious eye irritation.

H335 May cause respiratory irritation.

GHS Precautionary Statements

P261 Avoid breathing dust/fume/gas/mist/vapours/spray

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P305/P351/P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

2.3 Unclassified Hazards/Hazards Not Otherwise Classified

No data available.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Molecular Formula: $C_{10}HF_{21}O_3S$

Molecular Weight: 600.14

CAS Registry #: 335-77-3

EC#: 206-401-9

Synonyms

1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-Heneicosafluoro-1-decanesulfonic Acid 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-Henicosafuorodecane-1-sulfonate

3.2 Mixtures

Not a mixture.

4. FIRST AID MEASURES

4.1 Description of First Aid Measures

General Advice

If medical attention is required, show this safety data sheet to the doctor.

If Inhaled

If inhaled, move person to fresh air. If not breathing, give artificial respiration and consult a physician.

In Case of Skin Contact

Wash affected area with soap and water. Consult a physician if any exposure symptoms are observed.

In Case of Eye Contact

Immediately rinse eyes with plenty of water for at least 15 minutes. Consult a physician.

If Swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Do NOT induce vomiting unless advised to do so by a physician or Poison Control Center. Seek medical attention.

4.2 Most Important Symptoms and Effects, Both Acute and Delayed

The most important known symptoms and effects are described in the labeling (see section 2.2) and/or section 11.

4.3 Indication of any Immediate Medical Attention and Special Treatment Needed

No data available.

5. FIREFIGHTING MEASURES

5.1 Extinguishing Media

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

5.2 Special Hazards Arising from the Substance or Mixture

Carbon oxides, Sulfur oxides, Hydrogen fluoride

5.3 Advice for Firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further Information

No data available.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Method and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed.

7.2 Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place. Keep in a dry place.

Storage conditions: Hygroscopic, -20°C Freezer, Under inert atmosphere

7.3 Specific End Uses

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control Parameters

Contains no components with established occupational exposure limits.

8.2 Exposure Controls

Appropriate Engineering Controls

A laboratory fumehood or other appropriate form of local exhaust ventilation should be used to avoid exposure.

Personal Protective Equipment

All recommendations below are advisory in nature and a risk assessment should be performed by the employer/end user prior to use of this product. The type of protective equipment must be selected based on the amount and concentration of the dangerous material being used in the workplace.

Eye/Face Protection

Safety goggles or face shield. All equipment should have been tested and approved under appropriate standards, such as NIOSH (US), CSA (Canada), or EN 166 (EU).

Skin Protection

Gloves should be used when handling this material. Gloves are to be inspected prior to use. Contaminated gloves are to be removed using proper glove removal technique so that the outer surface of the glove does not contact bare skin. Dispose of contaminated gloves after use in compliance with good laboratory practices and local requirements.

Gloves used for incidental exposures (splash protection) should be designated as "chemical resistant" by EU standard EN 374 with the resistance codes corresponding to the anticipated use of the material. Unrated gloves are not recommended.

Suggested gloves: AnsellPro Sol-Vex nitrile gloves style 37-175, 15 mil thickness.

Penetration time has not been determined.

Gloves used for prolonged direct exposure (immersion) should be designated "chemical resistant" as per EN 734 with the resistance codes corresponding to the anticipated use of the material.

Suggested gloves: AnsellPro Viton/Butyl gloves style 38-612, 4/8 mil thickness.

Penetration time has not been determined.

These recommendations may not apply if the material is mixed with any other chemical, or dissolved into a solution. A risk assessment must be performed to ensure the gloves will still offer acceptable protection.

Body Protection

Fire resistant (Nomex) lab coat or coveralls.

Respiratory Protection

Recommended respirators are NIOSH-approved N100 or CEN-approved FFP3 particulate respirators. These are to be only used as a backup to local exhaust ventilation or other engineering controls. If the respirator is the only means of protection, a full-face supplied air respirator must be used.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on Basic Physical and Chemical Properties

A) Appearance

Dark Brown to Very Dark Brown Solid

C) Odour Threshold

No data available

E) Melting Point/Freezing Point

No data available

G) Flash point

No data available

I) Flammability (Solid/Gas)

No data available

K) Vapour Pressure

No data available

M) Relative Density

No data available

O) Partition Coefficient: n-octanol/water

No data available

B) Odour

No data available

D) pH

No data available

F) Initial Boiling Point/Boiling Range

No data available

H) Evaporation Rate

No data available

J) Upper/Lower Flammability/Explosive Limits

No data available

L) Vapour Density

No data available

N) Solubility

Acetone (Slightly), DMSO (Slightly), Methanol (Slightly)

P) Auto-Ignition Temperature

No data available

Q) Decomposition Temperature

No data available

S) Explosive Properties

No data available

R) Viscosity

No data available

T) Oxidizing Properties

No data available

9.2 Other Information

no data available

10. STABILITY AND REACTIVITY**10.1 Reactivity**

No data available.

10.2 Chemical Stability

Stable under recommended storage conditions.

10.3 Possibility of Hazardous Reactions

No data available.

10.4 Conditions to Avoid

No data available.

10.5 Incompatible Materials

Strong oxidizing agents.

10.6 Hazardous Decomposition Products

In the event of fire: See section 5. Other decomposition products: No data available.

11. TOXICOLOGICAL INFORMATION**11.1 Information on Toxicological Effects****A) Acute Toxicity**

Oral LD50: No data available.

Inhalation LC50: No data available.

Dermal LD50: No data available.

B) Skin Corrosion/Irritation

Moderate skin irritant.

C) Serious Eye Damage/Irritation

Moderate eye irritant.

D) Respiratory or Skin Sensitization

No data available

E) Germ Cell Mutagenicity

No data available

F) Carcinogenicity

No data available

G) Reproductive Toxicity/Teratogenicity

No data available

H) Single Target Organ Toxicity - Single Exposure

Moderate respiratory tract irritation.

I) Single Target Organ Toxicity - Repeated Exposure

No data available

J) Aspiration Hazard

No data available

K) Potential Health Effects and Routes of Exposure**Inhalation**

May be harmful if inhaled. Causes respiratory tract irritation.

Ingestion

May be harmful if swallowed.

Skin

May be harmful if absorbed through skin. Causes skin irritation.

Eyes

Causes eye irritation.

L) Signs and Symptoms of Exposure

The most important known symptoms and effects are described in the labeling (see section 2.2) and/or section 11.

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

M) Additional Information

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

No data available.

12.2 Persistence and Degradability

No data available.

12.3 Bioaccumulative Potential

No data available.

12.4 Mobility in Soil

No data available.

12.5 Results of PBT and vPvB Assessment

No data available.

12.6 Other Adverse Effects

No data available.

13. DISPOSAL CONSIDERATIONS**13.1 Waste Treatment Methods****A) Product**

Product may be burned in an incinerator equipped with afterburner and scrubber. Excess and expired materials are to be offered to a licensed hazardous material disposal company. Ensure that all Federal and Local regulations regarding the disposal and destruction of this material are followed.

B) Contaminated Packaging

Dispose of as above.

C) Other Considerations

Product is not to be disposed of in sanitary sewers, storm sewers, or landfills.

14. TRANSPORT INFORMATION**14.1 UN Number**

DOT (US): N/A

IATA: N/A

IMDG: N/A

ADR/RID: N/A

14.2 UN Proper Shipping Name

DOT (US)/IATA:

Not dangerous goods

IMDG/ARD/RID:

Not dangerous goods

14.3 Transport Hazard Class(es)

DOT (US): N/A

IATA: N/A

IMDG: N/A

ADR/RID: N/A

14.4 Packing Group

DOT (US): N/A

IATA: N/A

IMDG: N/A

ADR/RID: N/A

14.5 Environmental Hazards

DOT (US): None

IATA: None

IMDG: None

ADR/RID: None

14.6 Special Precautions for User

None

15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of WHMIS (Canada), OSHA 1910.1200 (US), and EU Regulation EC No. 1907/2006 (European Union).

15.1 Safety, Health and Environmental Regulations/Legislation Specific for the Substance or Mixture**A) Canada****DSL/NDSL Status:** This product is not listed on the Canadian DSL/NDSL.**B) United States****TSCA Status:** This product is not listed on the US EPA TSCA.**C) European Union****ECHA Status:** This product is not registered with the EU ECHA.**15.2 Chemical Safety Assessment**

No data available

16. OTHER INFORMATION**16.1 Revision History**

Original Publication Date: 8/24/2016

16.2 List of Abbreviations

LD50	Median lethal dose of a substance required to kill 50% of a test population.
LC50	Medial lethal concentration of a substance required to kill 50% of a test population.
LDLo	Lowest known lethal dose

TDLo	Lowest known toxic dose
IARC	International Agency for Research on Cancer
NTP	National Toxicology Program
RTECS	Registry of Toxic Effects of Chemical Substances

16.3 Further Information

Copyright 2015. Toronto Research Chemicals Inc. Copies may be made for internal use only. The above information is believed to be correct to the best of our knowledge, but is to be only used as a guide. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Please take all due care when handling this product.



TCI AMERICA

SAFETY DATA SHEET

Page 1 of 5

Revision number: 1
Revision date: 07/06/2018

1. IDENTIFICATION

Product name: Tridecafluoroheptanoic Acid
Product code: T1545
Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborside Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Eye Damage/Irritation [Category 1]
WHMIS 2015: Corrosive to Metals [Category 1]
Skin Corrosion/Irritation [Category 1C]

Signal word: Danger!

Hazard Statement(s): May be corrosive to metals
Causes severe skin burns and eye damage

Pictogram(s) or Symbol(s):



Precautionary Statement(s):
[Prevention]

[Response]

[Storage]

[Disposal]

Keep only in original container. Do not breathe dusts or mists. Wash hands and face thoroughly after handling. Wear protective gloves, protective clothing, face protection.
If swallowed: Rinse mouth. Do NOT induce vomiting. Immediately call a poison center or doctor. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Immediately call a poison center or doctor. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. 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 or doctor. Absorb spillage to prevent material damage.
Store in corrosive resistant bottle or metal container with a resistant inner liner. Store locked up.
Dispose of contents and container in accordance with local, regional, national regulations (e.g. US: 40 CFR Part 261, EU:91/156/EEC, JP: Waste Disposal and Cleaning Act, etc.).

Hazards not otherwise classified: None.
[HNOC]

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/mixture:	Substance
Components:	Tridecafluoroheptanoic Acid
Percent:	>98.0%(T)
CAS RN:	375-85-9
Molecular Weight:	364.06
Chemical Formula:	C ₇ HF ₁₃ O ₂
Synonyms:	Perfluoroenanthic Acid , Perfluoroheptanoic Acid , Tridecafluoroenanthic Acid

4. FIRST-AID MEASURES**Description of first aid measures**

Inhalation:	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician.
Skin contact:	Remove/Take off immediately all contaminated clothing. Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor/physician.
Eye contact:	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.
Ingestion:	Immediately call a POISON CENTER or doctor/physician. Rinse mouth. Do NOT induce vomiting.

Symptoms/effects:

Acute:	Pain. Redness.
Delayed:	No data available

Indication of any immediate medical attention:

Not available.

Notes to physician:

No data available

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media:	Dry chemical, foam, water spray, carbon dioxide.
Specific hazards arising from the chemical:	Take care as it may decompose upon combustion or in high temperatures to generate poisonous fume.
Hazardous combustion products:	These products include: Carbon oxides Halogenated compounds
Other specific hazards:	WARNING: Highly toxic HF gas is produced during combustion.
Advice for firefighters:	Wear self-contained breathing apparatus if possible.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures:	Use personal protective equipment. Keep people away from and upwind of spill/leak. Entry to non-involved personnel should be controlled around the leakage area by roping off, etc.
Environmental precautions:	Prevent product from entering drains.
Methods and materials for containment and cleaning up:	Sweep dust to collect it into an airtight container, taking care not to disperse it. Adhered or collected material should be promptly disposed of, in accordance with appropriate laws and regulations.

7. HANDLING AND STORAGE

Precautions for safe handling:	Handling is performed in a well ventilated place. Wear suitable protective equipment. Prevent dispersion of dust. Wash hands and face thoroughly after handling. Use a closed system if possible. Use a local exhaust if dust or aerosol will be generated. Avoid contact with skin, eyes and clothing. Use corrosive resistant equipment.
Conditions for safe storage, including any incompatibilities	
Storage conditions:	Keep container tightly closed. Store in a cool and dark place. Store locked up. Store away from incompatible materials such as oxidizing agents.
Packaging material:	Comply with laws. Keep only in original container.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Appropriate engineering controls:	Follow safe industrial engineering/laboratory practices when handling any chemical. Install a closed system or local exhaust. Also install safety shower and eye bath.
Personal protective equipment	
Respiratory protection:	Dust respirator, self-contained breathing apparatus(SCBA), supplied air respirator, etc. Use respirators approved under appropriate government standards and follow local and national regulations.
Hand protection:	Impervious gloves.
Eye protection:	Safety goggles. A face-shield, if the situation requires.
Skin and body protection:	Impervious protective clothing. Protective boots, if the situation requires.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C):	Solid		
Form:	Crystal - Lump		
Colour:	White - Very pale yellow		
Odour:	No data available		
Odor threshold:	No data available		
Odour threshold:	No data available		
Melting point/freezing point:	32°C (Freezing point) (90°F)	pH:	No data available
Boiling point/range:	177°C (351°F)	Vapour pressure:	No data available.
Decomposition temperature:	No data available	Vapour density:	No data available
Relative density:	No data available	Dynamic Viscosity:	No data available
Kinematic viscosity:	No data available		
Log Pow:	No data available	Evaporation rate(Butyl Acetate=1):	No data available
Flash point:	No data available	Autoignition temperature:	No data available
Flammability(solid, gas):	No data available	Flammability or explosive limits:	
		Lower:	No data available
		Upper:	No data available
Solubility(ies):			
[Water]	No data available		
[Other solvents]	No data available		

10. STABILITY AND REACTIVITY

Reactivity:	No data available
Chemical stability:	Stable under proper conditions.
Possibility of hazardous reactions:	No special reactivity has been reported.
Incompatible materials:	Oxidizing agents
Hazardous decomposition products:	Carbon dioxide, Carbon monoxide, Hydrogen fluoride

11. TOXICOLOGICAL INFORMATION**Acute Toxicity:**

No data available

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available**NTP:** No data available**OSHA:** No data available**Reproductive toxicity:**

No data available

Target organ(s):

No data available

12. ECOLOGICAL INFORMATION**Ecotoxicity:****Fish:**

No data available

Crustacea:

No data available

Algae:

No data available

Persistence / degradability:

No data available

Bioaccumulative potential(BCF):

No data available

Mobility in soil**Log Pow:**

No data available

Soil adsorption (Koc):

No data available

Henry's Law (PaM ³/mol):

No data available

13. DISPOSAL CONSIDERATIONS**Disposal of product:**

Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.

Disposal of container:

Dispose of as unused product. Do not re-use empty containers.

Other considerations:

Observe all federal, state and local regulations when disposing of the substance.

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

UN number: UN3261	Proper Shipping Name: Corrosive solid, acidic, organic, n.o.s	Class or Division: 8 Corrosive material	Packing Group: III
-----------------------------	---	---	------------------------------

IATA

UN number: UN3261	Proper Shipping Name: Corrosive solid, acidic, organic, n.o.s	Class or Division: 8 Corrosive material	Packing Group: III
-----------------------------	---	---	------------------------------

IMDG

UN number: UN3261	Proper Shipping Name: Corrosive solid, acidic, organic, n.o.s	Class or Division: 8 Corrosive material	Packing Group: III
-----------------------------	---	---	------------------------------

EmS number: F-A, S-B

15. REGULATORY INFORMATION**Toxic Substance Control Act (TSCA 8b.):**

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations**CERCLA Hazardous substance and Reportable Quantity:**

SARA 313:	Not Listed
SARA 302:	Not Listed

State Regulations**State Right-to-Know**

Massachusetts	Not Listed
New Jersey	Not Listed
Pennsylvania	Not Listed

California Proposition 65:	Not Listed
-----------------------------------	------------

Other Information**NFPA Rating:**

Health:	3
Flammability:	1
Instability:	0

HMIS Classification:

Health:	3
Flammability:	1
Physical:	0

International Inventories

Canada: NDSL	On NDSL
EC-No:	206-798-9

16. OTHER INFORMATION

Revision date: 07/06/2018

Revision number: 1

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid

Safety Data Sheet 616432S

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 09/04/2016

Version: 1.0

SECTION 1: Identification

1.1. Identification

Product form	: Substance
Substance name	: 1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid
CAS No	: 375-92-8
Product code	: 6164-3-2S
Formula	: C ₇ HF ₁₅ O ₃ S
Synonyms	: Perfluoroheptanesulfonic acid
Other means of identification	: MFCD28015666

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	: Laboratory chemicals Manufacture of substances Scientific research and development
------------------------------	--

1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.
P.O. Box 309
Alachua, FL 32615 - United States of America
T (386) 462-0788 - F (386) 462-7097
info@synquestlabs.com - www.synquestlabs.com

1.4. Emergency telephone number

Emergency number	: (844) 523-4086 (3E Company - Account 10069)
------------------	---

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Acute Tox. 4 (Oral)	H302 - Harmful if swallowed
Skin Corr. 1B	H314 - Causes severe skin burns and eye damage
Eye Dam. 1	H318 - Causes serious eye damage
STOT SE 3	H335 - May cause respiratory irritation

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US)



GHS05

GHS07

Signal word (GHS-US)

: Danger

Hazard statements (GHS-US)

: H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H335 - May cause respiratory irritation

Precautionary statements (GHS-US)

: P260 - Do not breathe dust, mist, 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
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301+P312 - If swallowed: Call a POISON CENTER or doctor/ physician if you feel unwell
P301+P330+P331 - If swallowed: rinse mouth. Do NOT induce vomiting
P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/ physician

1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

P321 - Specific treatment (see supplemental first aid instructions on this label)
P330 - Rinse mouth
P363 - Wash contaminated clothing before reuse
P403+P233 - 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

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid (Main constituent)	(CAS No) 375-92-8	<= 100	Acute Tox. 4 (Oral), H302 Skin Corr. 1B, H314 Eye Dam. 1, H318 STOT SE 3, H335

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Get immediate medical advice/attention.

First-aid measures after skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Get immediate medical advice/attention.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.

First-aid measures after ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth out with water. Get immediate medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

Symptoms/injuries after inhalation : Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen fluoride. Sulfur oxides.

5.3. Advice for firefighters

Firefighting instructions : In case of fire: Evacuate area.

Protection during firefighting : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe dust.

1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

6.1.1. For non-emergency personnel

Emergency procedures : Only qualified personnel equipped with suitable protective equipment may intervene.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment : Stop leak if safe to do so.
Methods for cleaning up : Sweep or shovel spills into appropriate container for disposal. Minimize generation of dust.
Other information : For disposal of solid materials or residues refer to section 13 : "Disposal considerations".

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Ensure good ventilation of the work station. Do not breathe dust, mist, spray. Wear personal protective equipment. Avoid contact with skin and eyes.
Hygiene measures : Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Comply with applicable regulations.
Storage conditions : Keep container closed when not in use.
Incompatible materials : Refer to Section 10 on Incompatible Materials.
Storage area : Store in dry, cool, well-ventilated area.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Exposure controls

Appropriate engineering controls : Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Hand protection : Protective gloves. 29 CFR 1910.138: Hand Protection.
Eye protection : Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.
Skin and body protection : Wear suitable protective clothing.
Respiratory protection : In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory Protection.
Other information : Safety shoes. 29 CFR 1910.136: Foot Protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Solid
Color : No data available
Odor : No data available
Odor threshold : No data available
pH : No data available
Melting point : No data available
Freezing point : No data available
Boiling point : No data available
Flash point : No data available
Relative evaporation rate (butyl acetate=1) : No data available
Flammability (solid, gas) : No data available

1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Explosion limits	: No data available
Explosive properties	: No data available
Oxidizing properties	: No data available
Vapor pressure	: No data available
Relative density	: No data available
Relative vapor density at 20 °C	: No data available
Molecular mass	: 450.12 g/mol
Solubility	: No data available
Log Pow	: No data available
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Viscosity	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

The product is stable at normal handling and storage conditions.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong bases. Strong oxidizing agents. Strong reducing agents.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	: Oral: Harmful if swallowed.
Skin corrosion/irritation	: Causes severe skin burns and eye damage.
Serious eye damage/irritation	: Causes serious eye damage.
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
Specific target organ toxicity (single exposure)	: May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	: Not classified
Aspiration hazard	: Not classified
Symptoms/injuries after inhalation	: Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.

SECTION 12: Ecological information

12.1. Toxicity

No additional information available

1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

- | | |
|--------------------------------|---|
| Waste treatment methods | : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber. |
| Waste disposal recommendations | : Dispose of contents/container in accordance with licensed collector's sorting instructions. |
| Additional information | : Recycle the material as far as possible. |

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN3261 Corrosive solid, acidic, organic, n.o.s., 8, II

UN-No.(DOT) : UN3261

Proper Shipping Name (DOT) : Corrosive solid, acidic, organic, n.o.s.

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Hazard labels (DOT) : 8 - Corrosive



Packing group (DOT) : II - Medium Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 212

DOT Packaging Bulk (49 CFR 173.xxx) : 240

DOT Symbols : G - Identifies PSN requiring a technical name

DOT Special Provisions (49 CFR 172.102) : IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).
IP2 - When IBCs other than metal or rigid plastics IBCs are used, they must be offered for transportation in a closed freight container or a closed transport vehicle.
IP4 - Flexible, fiberboard or wooden IBCs must be sift-proof and water-resistant or be fitted with a sift-proof and water-resistant liner.
T3 - 2.65 178.274(d)(2) Normal..... 178.275(d)(2)
TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 15 kg

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 50 kg

1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

DOT Vessel Stowage Location	: B - (i) The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) "On deck only" on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this section is exceeded.
Other information	: No supplementary information available.

TDG

No additional information available

Transport by sea

UN-No. (IMDG)	: 3261
Proper Shipping Name (IMDG)	: CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S.
Class (IMDG)	: 8 - Corrosive substances
Packing group (IMDG)	: II - substances presenting medium danger

Air transport

UN-No. (IATA)	: 3261
Proper Shipping Name (IATA)	: Corrosive solid, acidic, organic, n.o.s.
Class (IATA)	: 8 - Corrosives
Packing group (IATA)	: II - Medium Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid (375-92-8)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
EPA TSCA Regulatory Flag	S - S - indicates a substance that is identified in a proposed or final Significant New Uses Rule.

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid (375-92-8)
Listed on the Canadian NDSL (Non-Domestic Substances List)

EU-Regulations

No additional information available

National regulations

1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid (375-92-8)
Listed on the Japanese ISHL (Industrial Safety and Health Law)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

SECTION 16: Other information

1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Full text of H-phrases:

Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Skin Corr. 1B	Skin corrosion/irritation Category 1B
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H335	May cause respiratory irritation

NFPA health hazard

: 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.

NFPA fire hazard

: 0 - Materials that will not burn.

NFPA reactivity

: 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health

: 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability

: 0 Minimal Hazard - Materials that will not burn

Physical

: 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable for any damage resulting from handling or from contact with the above product.



TCI AMERICA

SAFETY DATA SHEET

Page 1 of 5

Revision number: 1
Revision date: 07/06/2018

1. IDENTIFICATION

Product name: Undecafluorohexanoic Acid High Grade [Ion-Pair Reagent for LC-MS]
Product code: A5722

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborside Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Eye Damage/Irritation [Category 1]
WHMIS 2015: Corrosive to Metals [Category 1]
Skin Corrosion/Irritation [Category 1B]

Signal word: Danger!

Hazard Statement(s): May be corrosive to metals
Causes severe skin burns and eye damage

Pictogram(s) or Symbol(s):



Precautionary Statement(s):
[Prevention]

[Response]

[Storage]

[Disposal]

Keep only in original container. Do not breathe dusts or mists. Wash hands and face thoroughly after handling. Wear protective gloves, protective clothing, face protection.
If swallowed: Rinse mouth. Do NOT induce vomiting. Immediately call a poison center or doctor. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Immediately call a poison center or doctor. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. 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 or doctor. Absorb spillage to prevent material damage.
Store in corrosive resistant bottle or metal container with a resistant inner liner. Store locked up.
Dispose of contents and container in accordance with local, regional, national regulations (e.g. US: 40 CFR Part 261, EU: 91/156/EEC, JP: Waste Disposal and Cleaning Act, etc.).

Hazards not otherwise classified: None.
[HNOC]

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/mixture:	Substance
Components:	Undecafluorohexanoic Acid High Grade [Ion-Pair Reagent for LC-MS]
Percent:	>98.0%(T)
CAS RN:	307-24-4
Molecular Weight:	314.05
Chemical Formula:	C ₆ HF ₁₁ O ₂
Synonyms:	IPC-PFFA-6 HG , Perfluorohexanoic Acid High Grade

4. FIRST-AID MEASURES

Description of first aid measures

Inhalation:	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician.
Skin contact:	Remove/Take off immediately all contaminated clothing. Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor/physician.
Eye contact:	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.
Ingestion:	Immediately call a POISON CENTER or doctor/physician. Rinse mouth. Do NOT induce vomiting.

Symptoms/effects:

Acute:	Pain. Redness.
Delayed:	No data available

Indication of any immediate medical attention:

Not available.

Notes to physician:

No data available

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media:	Dry chemical, foam, water spray, carbon dioxide.
Specific hazards arising from the chemical:	Take care as it may decompose upon combustion or in high temperatures to generate poisonous fume.
Hazardous combustion products:	These products include: Carbon oxides Halogenated compounds
Other specific hazards:	WARNING: Highly toxic HF gas is produced during combustion.
Advice for firefighters:	Wear self-contained breathing apparatus if possible.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures:	Use personal protective equipment. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Entry to non-involved personnel should be controlled around the leakage area by roping off, etc.
Environmental precautions:	Prevent product from entering drains.
Methods and materials for containment and cleaning up:	Absorb spilled material in a suitable absorbent (e.g. rag, dry sand, earth, saw-dust). In case of large amount of spillage, contain a spill by bunding. Adhered or collected material should be promptly disposed of, in accordance with appropriate laws and regulations.

7. HANDLING AND STORAGE

Precautions for safe handling:	Handling is performed in a well ventilated place. Wear suitable protective equipment. Prevent generation of vapour or mist. Wash hands and face thoroughly after handling. Use a closed system if possible. Use a ventilation, local exhaust if vapour or aerosol will be generated. Avoid contact with skin, eyes and clothing. Use corrosive resistant equipment.
Conditions for safe storage, including any incompatibilities	
Storage conditions:	Keep container tightly closed. Store in a cool and dark place. Store under inert gas. Protect from moisture. Store locked up. Store away from incompatible materials such as oxidizing agents. Light-sensitive Hygroscopic
Packaging material:	Comply with laws. Keep only in original container.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Appropriate engineering controls:	Follow safe industrial engineering/laboratory practices when handling any chemical. Install a closed system or local exhaust. Also install safety shower and eye bath.
Personal protective equipment	
Respiratory protection:	Half or full facepiece respirator, self-contained breathing apparatus(SCBA), supplied air respirator, etc. Use respirators approved under appropriate government standards and follow local and national regulations.
Hand protection:	Impervious gloves.
Eye protection:	Safety goggles. A face-shield, if the situation requires.
Skin and body protection:	Impervious protective clothing. Protective boots, if the situation requires.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C):	Liquid		
Form:	Clear		
Colour:	Colorless - Almost colorless		
Odour:	No data available		
Odor threshold:	No data available		
Odour threshold:	No data available		
Melting point/freezing point:	14°C (57°F)	pH:	No data available
Boiling point/range:	157°C (315°F)	Vapour pressure:	No data available.
Decomposition temperature:	No data available	Vapour density:	No data available
Relative density:	1.76	Dynamic Viscosity:	No data available
Kinematic viscosity:	No data available		
Log Pow:	No data available	Evaporation rate(Butyl Acetate=1):	No data available
Flash point:	No data available	Autoignition temperature:	No data available
Flammability(solid, gas):	No data available	Flammability or explosive limits:	
		Lower:	No data available
		Upper:	No data available
Solubility(ies):			
[Water]	No data available		
[Other solvents]	No data available		

10. STABILITY AND REACTIVITY

Reactivity:	No data available
Chemical stability:	Stable under proper conditions.
Possibility of hazardous reactions:	No special reactivity has been reported.
Incompatible materials:	Oxidizing agents
Hazardous decomposition products:	Carbon dioxide, Carbon monoxide, Hydrogen fluoride

11. TOXICOLOGICAL INFORMATION

Acute Toxicity:

No data available

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available

NTP: No data available

OSHA: No data available

Reproductive toxicity:

No data available

Target organ(s):

No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity:

Fish: No data available

Crustacea: No data available

Algae: No data available

Persistence / degradability:

No data available

Bioaccumulative potential(BCF):

No data available

Mobility in soil

Log Pow: No data available

Soil adsorption (Koc): No data available

Henry's Law (PaM³/mol): No data available

13. DISPOSAL CONSIDERATIONS

Disposal of product:

Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.

Disposal of container:

Dispose of as unused product. Do not re-use empty containers.

Other considerations:

Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)

UN number: UN3265	Proper Shipping Name: Corrosive liquid, acidic, organic, n.o.s	Class or Division: 8 Corrosive material	Packing Group: II
-----------------------------	--	---	-----------------------------

IATA

UN number: UN3265	Proper Shipping Name: Corrosive liquid, acidic, organic, n.o.s	Class or Division: 8 Corrosive material	Packing Group: II
-----------------------------	--	---	-----------------------------

IMDG

UN UN3265 numb er:	Proper Shipping Name: Corrosive liquid, acidic, organic, n.o.s	Class or Division: 8 Corrosive material	Packing Group: II
---	--	---	-----------------------------

EmS number: F-A, S-B

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313:	Not Listed
SARA 302:	Not Listed

State Regulations

State Right-to-Know

Massachusetts	Not Listed
New Jersey	Not Listed
Pennsylvania	Not Listed

California Proposition 65:	Not Listed
-----------------------------------	------------

Other Information

NFPA Rating:

Health:	3
Flammability:	0
Instability:	0

HMIS Classification:

Health:	3
Flammability:	0
Physical:	0

International Inventories

Canada: NDSL	On NDSL
EC-No:	206-196-6

16. OTHER INFORMATION

Revision date: 07/06/2018

Revision number: 1

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

Perfluorohexanesulfonic acid

Safety Data Sheet 616432T

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 09/21/2016

Version: 1.0

SECTION 1: Identification

1.1. Identification

Product form	: Substance
Substance name	: Perfluorohexanesulfonic acid
CAS No	: 355-46-4
Product code	: 6164-3-2T
Formula	: C ₆ HF ₁₃ O ₃ S
Synonyms	: 1,1,2,2,3,3,4,4,5,5,6,6-Tridecafluorohexane-1-sulfonic acid
Other means of identification	: MFCD00042453

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	: Laboratory chemicals Manufacture of substances Scientific research and development
------------------------------	--

1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.
P.O. Box 309
Alachua, FL 32615 - United States of America
T (386) 462-0788 - F (386) 462-7097
info@synquestlabs.com - www.synquestlabs.com

1.4. Emergency telephone number

Emergency number	: (844) 523-4086 (3E Company - Account 10069)
------------------	---

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Acute Tox. 4 (Oral)	H302 - Harmful if swallowed
Skin Corr. 1B	H314 - Causes severe skin burns and eye damage
Eye Dam. 1	H318 - Causes serious eye damage
STOT SE 3	H335 - May cause respiratory irritation

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US)



Signal word (GHS-US)

: Danger

Hazard statements (GHS-US)

: H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H335 - May cause respiratory irritation

Precautionary statements (GHS-US)

: P260 - Do not breathe dust, mist, 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
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301+P312 - If swallowed: Call a POISON CENTER or doctor/ physician if you feel unwell
P301+P330+P331 - If swallowed: rinse mouth. Do NOT induce vomiting
P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/ physician
P321 - Specific treatment (see supplemental first aid instructions on this label)
P330 - Rinse mouth

Perfluorohexanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

P363 - Wash contaminated clothing before reuse
P403+P233 - 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

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
Perfluorohexanesulfonic acid (Main constituent)	(CAS No) 355-46-4	<= 100	Acute Tox. 4 (Oral), H302 Skin Corr. 1B, H314 Eye Dam. 1, H318 STOT SE 3, H335

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Get immediate medical advice/attention.

First-aid measures after skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Get immediate medical advice/attention.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.

First-aid measures after ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth out with water. Get immediate medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

Symptoms/injuries after inhalation : Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen fluoride. Sulfur oxides.

5.3. Advice for firefighters

Firefighting instructions : In case of fire: Evacuate area.

Protection during firefighting : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe dust.

6.1.1. For non-emergency personnel

Emergency procedures : Only qualified personnel equipped with suitable protective equipment may intervene.

Perfluorohexanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment : Stop leak if safe to do so.
Methods for cleaning up : Sweep or shovel spills into appropriate container for disposal. Minimize generation of dust.
Other information : For disposal of solid materials or residues refer to section 13 : "Disposal considerations".

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Ensure good ventilation of the work station. Do not breathe dust, mist, spray. Wear personal protective equipment. Avoid contact with skin and eyes.
Hygiene measures : Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Comply with applicable regulations.
Storage conditions : Keep container closed when not in use. Hygroscopic. Keep contents under inert gas.
Incompatible materials : Refer to Section 10 on Incompatible Materials.
Storage area : Store in dry, cool, well-ventilated area.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Exposure controls

Appropriate engineering controls : Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Hand protection : Protective gloves. 29 CFR 1910.138: Hand Protection.
Eye protection : Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.
Skin and body protection : Wear suitable protective clothing.
Respiratory protection : In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory Protection.
Other information : Safety shoes. 29 CFR 1910.136: Foot Protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Solid
Color : No data available
Odor : No data available
Odor threshold : No data available
pH : No data available
Melting point : No data available
Freezing point : No data available
Boiling point : No data available
Flash point : No data available
Relative evaporation rate (butyl acetate=1) : No data available
Flammability (solid, gas) : No data available
Explosion limits : No data available
Explosive properties : No data available

Perfluorohexanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Oxidizing properties	: No data available
Vapor pressure	: No data available
Relative density	: No data available
Relative vapor density at 20 °C	: No data available
Molecular mass	: 400.11 g/mol
Solubility	: No data available
Log Pow	: No data available
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Viscosity	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

The product is stable at normal handling and storage conditions.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong bases. Strong oxidizing agents. Strong reducing agents.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	: Oral: Harmful if swallowed.
Skin corrosion/irritation	: Causes severe skin burns and eye damage.
Serious eye damage/irritation	: Causes serious eye damage.
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
Specific target organ toxicity (single exposure)	: May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	: Not classified
Aspiration hazard	: Not classified
Symptoms/injuries after inhalation	: Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.

SECTION 12: Ecological information

12.1. Toxicity

No additional information available

12.2. Persistence and degradability

No additional information available

Perfluorohexanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

- Waste treatment methods : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber.
- Waste disposal recommendations : Dispose of contents/container in accordance with licensed collector's sorting instructions.
- Additional information : Recycle the material as far as possible.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN3261 Corrosive solid, acidic, organic, n.o.s., 8, II

UN-No.(DOT) : UN3261

Proper Shipping Name (DOT) : Corrosive solid, acidic, organic, n.o.s.

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Hazard labels (DOT) : 8 - Corrosive



Packing group (DOT) : II - Medium Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 212

DOT Packaging Bulk (49 CFR 173.xxx) : 240

DOT Symbols : G - Identifies PSN requiring a technical name

DOT Special Provisions (49 CFR 172.102) : IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).
IP2 - When IBCs other than metal or rigid plastics IBCs are used, they must be offered for transportation in a closed freight container or a closed transport vehicle.
IP4 - Flexible, fiberboard or wooden IBCs must be sift-proof and water-resistant or be fitted with a sift-proof and water-resistant liner.
T3 - 2.65 178.274(d)(2) Normal..... 178.275(d)(2)
TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 15 kg

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 50 kg

Perfluorohexanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

DOT Vessel Stowage Location	: B - (i) The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) "On deck only" on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this section is exceeded.
Other information	: No supplementary information available.

TDG

No additional information available

Transport by sea

UN-No. (IMDG)	: 3261
Proper Shipping Name (IMDG)	: CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S.
Class (IMDG)	: 8 - Corrosive substances
Packing group (IMDG)	: II - substances presenting medium danger

Air transport

UN-No. (IATA)	: 3261
Proper Shipping Name (IATA)	: Corrosive solid, acidic, organic, n.o.s.
Class (IATA)	: 8 - Corrosives
Packing group (IATA)	: II - Medium Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Perfluorohexanesulfonic acid (355-46-4)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
EPA TSCA Regulatory Flag	S - S - indicates a substance that is identified in a proposed or final Significant New Uses Rule.

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

Perfluorohexanesulfonic acid (355-46-4)
Listed on the Canadian NDSL (Non-Domestic Substances List)

EU-Regulations

No additional information available

National regulations

Perfluorohexanesulfonic acid (355-46-4)
Listed on the Japanese ISHL (Industrial Safety and Health Law)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

SECTION 16: Other information

Perfluorohexanesulfonic acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Full text of H-phrases:

Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Skin Corr. 1B	Skin corrosion/irritation Category 1B
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H335	May cause respiratory irritation

NFPA health hazard

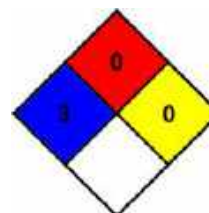
: 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.

NFPA fire hazard

: 0 - Materials that will not burn.

NFPA reactivity

: 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health

: 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability

: 0 Minimal Hazard - Materials that will not burn

Physical

: 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable for any damage resulting from handling or from contact with the above product.



TCI AMERICA

SAFETY DATA SHEET

Revision number: 2
Revision date: 10/06/2014

1. IDENTIFICATION

Product name: Heptadecafluorononanoic Acid
Product code: H0843

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborage Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Eye Damage/Irritation [Category 1]
Skin Corrosion/Irritation [Category 1C]

Signal word: Danger!

Hazard Statement(s): Causes serious eye damage
Causes severe skin burns and eye damage

Pictogram(s) or Symbol(s):



Precautionary Statement(s):
[Prevention]

Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves, protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full length face shield).

[Response]

If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

[Storage]

Store locked up.

[Disposal]

Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance
Components: Heptadecafluorononanoic Acid
Percent: >95.0%(GC)(T)

3. COMPOSITION/INFORMATION ON INGREDIENTS

CAS Number:	375-95-1
Molecular Weight:	464.08
Chemical Formula:	C ₉ HF ₁₇ O ₂
Synonyms:	Heptadecafluoropelargonic Acid , Perfluorononanoic Acid , Perfluoropelargonic Acid

4. FIRST-AID MEASURES

Inhalation:	Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Skin contact:	For severe burns, immediate medical attention is required. Immediately call a poison center or doctor. Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Eye contact:	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Ingestion:	Do not induce vomiting without medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Symptoms/effects:	
Acute:	Pain. Redness.
Delayed:	No data available
Immediate medical attention:	WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media:	Dry chemical, CO ₂ or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.
--------------------------------------	---

Specific hazards arising from the chemical

Hazardous combustion products:	These products include: Carbon oxides Halogenated compounds
Other specific hazards:	WARNING: Highly toxic HF gas is produced during combustion.

Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
Personal protective equipment:	Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).
Emergency procedures:	Prevent dust cloud. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and exercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

6. ACCIDENTAL RELEASE MEASURES**Methods and materials for containment and cleaning up:**

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material.

Environmental precautions:

Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

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

Avoid inhalation of vapor or mist. Manipulate under an adequate fume hood. Avoid contact with skin and eyes. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage:

Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities:

Bases, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION**Exposure limits:**

No data available

Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment**Respiratory protection:**

Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection:

Nitrile gloves.

Eye protection:

Safety glasses.

Skin and body protection:

Wear protective clothing (lab coat and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES**Physical state (20°C):**

Solid

Form:

Crystal - Powder

Color:

White - Pale yellow

Odor:

No data available

Odor threshold:

No data available

Melting point/freezing point:

65°C (149°F)

Boiling point/range:

No data available

Decomposition temperature:

No data available

Relative density:

No data available

Kinematic Viscosity:

No data available

Partition coefficient:

No data available

n-octanol/water (log P_{ow})**pH:**

No data available

Vapor pressure:

No data available

Vapor density:

No data available

Dynamic Viscosity:

No data available

Evaporation rate:

No data available

(Butyl Acetate = 1)

Flash point:

No data available

Flammability (solid, gas):

No data available

Autoignition temperature:

No data available

Flammability or explosive limits:

Lower: No data available

Upper: No data available

Solubility(ies):**10. STABILITY AND REACTIVITY****Reactivity:**

Not Available.

Chemical Stability:

Stable under recommended storage conditions. (See Section 7)

Possibility of Hazardous Reactions:

No hazardous reactivity has been reported.

Conditions to avoid:

Avoid excessive heat and light.

Incompatible materials:

Alkali, Bases, Reducing agents, Strong oxidizing agents

Hazardous Decomposition Products:

No data available

11. TOXICOLOGICAL INFORMATION**Acute Toxicity:**

No data available

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available**NTP:** No data available**OSHA:** No data available**Reproductive toxicity:**

No data available

Routes of Exposure:

Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Skin contact may produce burns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.

Potential Health Effects:

No specific information available; skin and eye contact may result in irritation. May be harmful if inhaled or ingested.

Target organ(s):

No data available

12. ECOLOGICAL INFORMATION**Ecotoxicity**

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

Persistence and degradability:	No data available
Bioaccumulative potential (BCF):	No data available
Mobility in soil:	No data available
Partition coefficient:	No data available
n-octanol/water (log P_{ow})	
Soil adsorption (K_{oc}):	No data available
Henry's Law:	No data available
constant (PaM³/mol)	

13. DISPOSAL CONSIDERATIONS

Disposal of product:	Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container:	Dispose of as unused product. Do not re-use empty containers.
Other considerations:	Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)	Non-hazardous for transportation.
-----------------	-----------------------------------

14. TRANSPORT INFORMATION**IATA** Non-hazardous for transportation.**IMDG** Non-hazardous for transportation.**15. REGULATORY INFORMATION****Toxic Substance Control Act (TSCA 8b.):**

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations**CERCLA Hazardous substance and Reportable Quantity:****SARA 313:** Not Listed
SARA 302: Not Listed**State Regulations****State Right-to-Know****Massachusetts** Not Listed
New Jersey Not Listed
Pennsylvania Not Listed
California Proposition 65: Not Listed**Other Information****NFPA Rating:****Health:** 2
Flammability: 0
Instability: 0**HMIS Classification:****Health:** 2
Flammability: 0
Physical: 0**International Inventories****WHMIS hazard class:** E: Corrosive material.
EC-No: 206-801-3**16. OTHER INFORMATION****Revision date:** 10/06/2014**Revision number:** 2

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

PERFLUOROOCTANOIC ACID**ICSC: 1613 (April 2017)**


Pentadecafluorooctanoic acid
 Pentadecafluoro-n-octanoic acid
 Perfluorocaprylic acid
 PFOA

CAS #: 335-67-1**UN #: 3261****EC Number: 206-397-9**

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with bases, oxidants or reducing agents.	NO contact with incompatible substances. See Chemical Dangers.	Use water spray, carbon dioxide, dry powder, foam.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection if powder.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Abdominal pain. Nausea. Vomiting. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered non-metallic containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	<p>According to UN GHS Criteria</p> <div style="text-align: center;">  <p>DANGER</p> </div> <p>Harmful if swallowed Toxic if inhaled Causes serious eye irritation May cause damage to immune system and liver through prolonged or repeated exposure May damage fertility or the unborn child May cause harm to breast-fed children Suspected of causing cancer</p> <p>Transportation UN Classification UN Hazard Class: 8; UN Pack Group: III</p>
STORAGE	
Store only in original container. Separated from food and feedstuffs and incompatible materials. See Chemical Dangers.	
PACKAGING	
Do not transport with food and feedstuffs. Unbreakable packaging. Put breakable packaging into closed unbreakable container.	



International
Labour
Organization



World Health
Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
 © ILO and WHO 2021



European
Commission

PERFLUOROOCTANOIC ACID**ICSC: 1613****PHYSICAL & CHEMICAL INFORMATION****Physical State; Appearance**

WHITE POWDER WITH PUNGENT ODOUR.

Physical dangers

No data.

Chemical dangers

Decomposes on heating above 300°C . This produces toxic and corrosive gases including hydrogen fluoride (See ICSC 0283). The solution is a weak acid. Reacts with bases, oxidants and reducing agents. This produces flammable/explosive gas (hydrogen - see ICSC 0001). Attacks many metals.

Formula: C₈HF₁₅O₂

Molecular mass: 414.1

Boiling point: 189°C

Melting point: 52-54°C

Density: 1.79 g/cm³

Solubility in water: none

Octanol/water partition coefficient as log Pow: 6.3

EXPOSURE & HEALTH EFFECTS**Routes of exposure**

The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

The substance may have effects on the liver and immune system. This substance is possibly carcinogenic to humans. May cause toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS





MAK: (inhalable fraction): 0.005 mg/m³; peak limitation category: II(8); skin absorption (H); carcinogen category: 4; pregnancy risk group: C

ENVIRONMENT**NOTES****ADDITIONAL INFORMATION****EC Classification**

Symbol: T, Xn; R: 40-61-48/23-48/21/22-41-64; S: 53-45

All rights reserved. The published material is being distributed without warranty of any kind, either expressed or implied. Neither ILO nor WHO nor the European Commission shall be responsible for the interpretation and use of the information contained in this material.

Material Safety Data Sheet

HAZARD WARNINGS	RISK PHRASES	PROTECTIVE CLOTHING
  	<p>Corrosive to eyes and skin on contact. Toxic compound, do not ingest or inhale. Avoid all contact with this material. Environmental hazard. This material is toxic to aquatic organisms and may cause long term adverse effects to the aquatic environment. POSSIBLE MUTAGEN. MINIMIZE EXPOSURE.</p>	

Section I. Chemical Product and Company Identification

Chemical Name	Heptadecafluorooctanesulfonic Acid		
Catalog Number	H0781	Supplier	TCI America 9211 N. Harbortgate St. Portland OR 1-800-423-8616
Synonym	Perfluorooctanesulfonic Acid		
Chemical Formula	C ₈ HF ₁₇ O ₃ S		
CAS Number	1763-23-1	In case of Emergency Call	Chemtrec® (800) 424-9300 (U.S.) (703) 527-3887 (International)

Section II. Composition and Information on Ingredients

Chemical Name	CAS Number	Percent (%)	TLV/PEL	Toxicology Data
Heptadecafluorooctanesulfonic Acid	1763-23-1	Min. 98.0 (T)	This compound is classified as a possible mutagen. There is no acceptable exposure limit for a mutagen.	Rat LD ₅₀ (oral) 154 mg/kg

Section III. Hazards Identification

Acute Health Effects	Corrosive to skin, eyes, and respiratory system. Liquid or spray mist may produce tissue damage, particularly in mucous membranes of the eyes, mouth and respiratory tract. Skin contact may produce burns. Eye contact can result in corneal damage or blindness. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Corrosive materials may cause serious injury if ingested. Toxic if ingested or inhaled. Avoid prolonged contact with this material. Overexposure may result in serious illness or death. Follow safe industrial hygiene practices and always wear proper protective equipment when handling this compound.
Chronic Health Effects	<p>CARCINOGENIC EFFECTS : Not available. MUTAGENIC EFFECTS : Not available. TERATOGENIC EFFECTS : Not available. DEVELOPMENTAL TOXICITY: Reproductive effects. Rat TDLo Oral 50 mg/kg, female 19-20 days of pregnancy TOXIC EFFECTS: Effects on Newborn - Viability index Effects on Newborn - Other neonatal measures or effects Effects on Newborn - Growth statistics Rat TDLo Oral 100 mg/kg, female 19-20 days of pregnancy TOXIC EFFECTS: Effects on Newborn - Stillbirth Rat TDLo Unreported 50 mg/kg, female 19-20 days of pregnancy TOXIC EFFECTS: Specific Developmental Abnormalities - Respiratory system Effects on Newborn - Live birth index Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.</p>

Section IV. 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 for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Inhalation	If the victim is not breathing, perform mouth-to-mouth resuscitation. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, oxygen can be administered. Seek medical attention if respiration problems do not improve.
Ingestion	DO NOT INDUCE VOMITING. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. 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.

Section V. Fire and Explosion Data

Flammability	May be combustible at high temperature.	Auto-Ignition	Not available.
Flash Points	Not available.	Flammable Limits	Not available.
Combustion Products	These products are toxic carbon oxides (CO, CO ₂), halogenated compounds, sulfur oxides (SO _x). WARNING: Highly toxic HF gas is produced during combustion.		
Fire Hazards	Not available.		
Explosion Hazards	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	SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. DO NOT use water jet. Consult with local fire authorities before attempting large scale fire-fighting operations.		


Section VI. Accidental Release Measures

Spill Cleanup Instructions	Corrosive material. Toxic material. Environmentally hazardous material. Possibly mutagenic material. Stop leak if without risk. DO NOT get water inside container. DO NOT touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all sources of ignition. Consult federal, state, and/or local authorities for assistance on disposal.
----------------------------	--

Section VII. Handling and Storage

Handling and Storage Information	CORROSIVE. TOXIC. ENVIRONMENTAL HAZARD. POSSIBLE MUTAGEN. Keep locked up. Keep container dry. Keep away from heat. Mechanical exhaust required. When not in use, tightly seal the container and store in a dry, cool place. Avoid excessive heat and light. DO NOT ingest. Do not breathe dust. Never add water to this product. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Treat symptomatically and supportively. Always store away from incompatible compounds such as oxidizing agents, alkalis (bases).
----------------------------------	---

Section VIII. Exposure Controls/Personal Protection

Engineering Controls	Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.
Personal Protection	Face shield. Lab coat. Dust respirator. Boots. Gloves. A MSHA/NIOSH approved respirator must be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product. 
Exposure Limits	This compound is classified as a possible mutagen. There is no acceptable exposure limit for a mutagen.

Section IX. Physical and Chemical Properties

Physical state @ 20°C	Solid. (White crystal ~ powder.)	Solubility	Soluble in water.
Specific Gravity	Not available.		
Molecular Weight	500.13	Partition Coefficient	Not available.
Boiling Point	260°C (500°F)	Vapor Pressure	0.3 Pa (@ 25°C)
Melting Point	90°C (194°F)	Vapor Density	Not available.
Refractive Index	Not available.	Volatility	Not available.
Critical Temperature	Not available.	Odor	Not available.
Viscosity	Not available.	Taste	Not available.

Section X. Stability and Reactivity Data

Stability	This material is stable if stored under proper conditions. (See Section VII for instructions)
Conditions of Instability	Avoid excessive heat and light.
Incompatibilities	Reactive with oxidizing agents, alkalis (bases).

Section XI. Toxicological Information

RTECS Number	RG9701600
Routes of Exposure	Eye Contact. Ingestion. Inhalation. Skin contact.
Toxicity Data	Rat LD ₅₀ (oral) 154 mg/kg
Chronic Toxic Effects	<p>CARCINOGENIC EFFECTS : Not available. MUTAGENIC EFFECTS : Not available. TERATOGENIC EFFECTS : Not available. DEVELOPMENTAL TOXICITY: Reproductive effects. Rat TDLo Oral 50 mg/kg, female 19-20 days of pregnancy TOXIC EFFECTS: Effects on Newborn - Viability index Effects on Newborn - Other neonatal measures or effects Effects on Newborn - Growth statistics Rat TDLo Oral 100 mg/kg, female 19-20 days of pregnancy TOXIC EFFECTS: Effects on Newborn - Stillbirth Rat TDLo Unreported 50 mg/kg, female 19-20 days of pregnancy TOXIC EFFECTS: Specific Developmental Abnormalities - Respiratory system Effects on Newborn - Live birth index Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.</p>
Acute Toxic Effects	<p>Corrosive to skin, eyes, and respiratory system. Liquid or spray mist may produce tissue damage, particularly in mucous membranes of the eyes, mouth and respiratory tract. Skin contact may produce burns. Eye contact can result in corneal damage or blindness. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Corrosive materials may cause serious injury if ingested. Toxic if ingested or inhaled. Avoid prolonged contact with this material. Overexposure may result in serious illness or death. Follow safe industrial hygiene practices and always wear proper protective equipment when handling this compound.</p>


Section XII. Ecological Information

Ecotoxicity	Not available.
Environmental Fate	<p>Perfluorooctane sulfonic acid's production and use as a precursor for fluorinated surfactants has resulted in its release to the environment through various waste streams. If released to air, an estimated vapor pressure of 2.0X10⁻³ mm Hg at 25 deg C indicates perfluorooctane sulfonic acid will exist solely as a vapor in the ambient atmosphere. Vapor-phase perfluorooctane sulfonic acid will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 110 days. If released to soil, perfluorooctane sulfonic acid is expected to have no mobility based upon an estimated Koc of 100,000. Perfluorooctane sulfonic acid is essentially nonvolatile. Perfluoro compound recalcitrance can be attributed to the stability conferred by fluorine substitutes and the absence of structures susceptible to electrophilic or nucleophilic attack. Perfluorooctane sulfonic acid reached 0% of its theoretical BOD in four weeks using an activated sludge inoculum in the manometric respirometry test. If released into water, perfluorooctane sulfonic acid is expected to adsorb to suspended solids and sediment based upon the estimated Koc. Volatilization from water surfaces is not expected to be an important fate process as the compound is essentially nonvolatile; an estimated volatilization half-life for a model pond is 3 years if adsorption is considered. An estimated BCF of 56 suggests the potential for bioconcentration in aquatic organisms is moderate. Monitoring studies however would suggest that this compound is highly bioaccumulative. As a class, fluorinated organic compounds are resistant to hydrolysis. Occupational exposure to perfluorooctane sulfonic acid may occur through inhalation and dermal contact with this compound at workplaces where perfluorooctane sulfonic acid is produced or used. Monitoring data indicate that the general population may be exposed to perfluorooctane sulfonic acid via ingestion of contaminated fish and drinking water, and dermal contact with this compound and other products containing perfluorooctane sulfonic acid.</p>

Section XIII. Disposal Considerations

Waste Disposal	Recycle to process, if possible. Consult your local regional authorities. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. Observe all federal, state and local regulations when disposing of the substance.
----------------	---

Section XIV. Transport Information

DOT Classification	DOT CLASS 8: Corrosive material DOT CLASS 6.1: Toxic material
PIN Number	UN2923
Proper Shipping Name	Corrosive solid, toxic, n.o.s.
Packing Group (PG)	II
DOT Pictograms	

Section XV. Other Regulatory Information and Pictograms

TSCA Chemical Inventory (EPA)	This compound is ON the EPA Toxic Substances Control Act (TSCA) inventory list.
WHMIS Classification (Canada)	CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS E: Corrosive solid. On NDSL.
EINECS Number (EEC)	217-179-8
EEC Risk Statements	R23/24/25- Toxic by inhalation, in contact with skin and if swallowed. R34- Causes burns. R46- May cause heritable genetic damage. R47- May cause birth defects. R51- Toxic to aquatic organisms. R53- May cause long-term adverse effects in the aquatic environment.
Japanese Regulatory Data	ENCS No. 2-1595

Section XVI. Other Information

Version 1.0
Validated on 1/6/2010.
Printed 1/6/2010.

Notice to Reader

TCI laboratory chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our MSDS sheets are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated MSDS sheets for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, facial mask, fume hood). For proper handling and disposal, always comply with federal, state, and local regulations.

Printed 1/6/2010.



TCI AMERICA

SAFETY DATA SHEET

Revision number: 1
Revision date: 11/12/2013

1. IDENTIFICATION

Product name: Nonfluorovaleric Acid (ca. 0.5mol/L in Water) [Ion-Pair Reagent for LC-MS]
Product code: A5714

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborage Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales@tciamerica.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Eye Damage/Irritation [Category 1]
Corrosive to Metals [Category 1]
Skin Corrosion/Irritation [Category 1B]

Signal word: Danger!

Hazard Statement(s): Causes serious eye damage
Causes severe skin burns and eye damage
May be corrosive to metals

Pictogram(s) or Symbol(s):



Precautionary Statement(s):
[Prevention]

Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves, protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full length face shield). Keep only in original container.

[Response]

If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Absorb spillage to prevent material damage.

[Storage]

Store locked up. Store in corrosive resistant container with a resistant inner liner.

[Disposal]

Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Mixture

3. COMPOSITION/INFORMATION ON INGREDIENTS

Components:	Nonafluorovaleric Acid (ca. 0.5mol/L in Water) [Ion-Pair Reagent for LC-MS]
Percent:
CAS Number:	2706-90-3
Molecular Weight:	264.05
Chemical Formula:	C ₅ HF ₉ O ₂
Synonyms:	IPC-PFFA-5 , Nonafluoropentanoic Acid , Perfluoropentanoic Acid , Perfluorovaleric Acid

4. FIRST-AID MEASURES

Inhalation:	Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Skin contact:	For severe burns, immediate medical attention is required. Immediately call a poison center or doctor. Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Eye contact:	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Ingestion:	Do not induce vomiting with out medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Symptoms/effects:	
Acute:	Pain. Redness.
Delayed:	No data available
Immediate medical attention:	WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media:	Dry chemical, CO ₂ or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.
-------------------------------	---

Specific hazards arising from the chemical

Hazardous combustion products:	These products include: Carbon oxides Halogenated compounds
Other specific hazards:	WARNING: Highly toxic HF gas is produced during combustion.

Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
Personal protective equipment:	Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures: In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and exercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Ventilate the area.

Environmental precautions:

Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breathe gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Avoid contact with skin and eyes. May corrode metallic surfaces. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store in corrosive resistant container with a resistant inner liner. Keep containers tightly closed in a cool, well-ventilated place. Store locked up. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Bases, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection: Nitrile gloves.

Eye protection: Wear eye protection (splash goggles) and face protection (full length face shield).

Skin and body protection: Wear protective clothing (lab coat and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid
Form: Clear
Color: Colorless - Almost colorless
Odor: No data available
Odor threshold: No data available

Melting point/freezing point: No data available
Boiling point/range: No data available
Decomposition temperature: No data available
Relative density: No data available
Kinematic viscosity: No data available
Partition coefficient: No data available
n-octanol/water (log P_{ow})

Flash point: No data available
Flammability (solid, gas): No data available

Solubility(ies):

pH: No data available
Vapor pressure: No data available
Vapor density: No data available
Dynamic Viscosity: No data available

Evaporation rate: No data available
(Butyl Acetate = 1)

Autoignition temperature: No data available
Flammability or explosive limits:
Lower: No data available
Upper: No data available

10. STABILITY AND REACTIVITY

Reactivity: Corrodes in contact with metals.
Chemical Stability: Stable under recommended storage conditions. (See Section 7)

10. STABILITY AND REACTIVITY

Possibility of Hazardous Reactions:	No hazardous reactivity has been reported.
Conditions to avoid:	Avoid excessive heat and light.
Incompatible materials:	Oxidizing agents
Hazardous Decomposition Products:	No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: No data available

Acute Toxicity:
No data available

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:
No data available

IARC: No data available

NTP: No data available

OSHA: No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:
Skin contact may produce burrns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.

Potential Health Effects:
No specific information available; skin and eye contact may result in irritation. May be harmful if inhaled or ingested.

Target organ(s): No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

Persistence and degradability:	No data available
Bioaccumulative potential (BCF):	No data available
Mobility in soil:	No data available
Partition coefficient:	No data available
n-octanol/water (log P_{ow})	
Soil adsorption (K_{oc}):	No data available
Henry's Law:	No data available
constant (PaM³/mol)	

13. DISPOSAL CONSIDERATIONS

Disposal of product:	Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container:	Dispose of as unused product. Do not re-use empty containers.

13. DISPOSAL CONSIDERATIONS

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3265	Corrosive liquid, acidic, organic, n.o.s.	8 Corrosive material	II

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3265	Corrosive liquid, acidic, organic, n.o.s.	8 Corrosive material	II

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3265	Corrosive liquid, acidic, organic, n.o.s.	8 Corrosive material	II

EmS number: F-A, S-B

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313:	Not Listed
SARA 302:	Not Listed

State Regulations

State Right-to-Know

Massachusetts	Not Listed
New Jersey	Not Listed
Pennsylvania	Not Listed
California Proposition 65:	Not Listed

Other Information

NFPA Rating:

Health:	3
Flammability:	0
Instability:	0

HMIS Classification:

Health:	3
Flammability:	0
Physical:	0

International Inventories

WHMIS hazard class:	E: Corrosive material.
EC-No:	220-300-7
Notice Through Official Gazettes Reference Number: (Japan)	
ENCS:	(2)-1182

16. OTHER INFORMATION

Revision date: 11/12/2013

Revision number: 1

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

1 Identification

Product identifier

Product name: Perfluorotetradecanoic acid

Stock number: L13796

CAS Number:
376-06-7

EC number:
206-803-4

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Manufacturer/Supplier:

Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)



GHS05 Corrosion

Skin Corr. 1B H314 Causes severe skin burns and eye damage.

Eye Dam. 1 H318 Causes serious eye damage.

Hazards not otherwise classified No information known.

Label elements

GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)

Hazard pictograms



GHS05

Signal word

Danger

Hazard statements

H314 Causes severe skin burns and eye damage.

Precautionary statements

P260 Do not breathe dust/fume/gas/mist/vapours/spray.
P303+P361+P353 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P301+P330+P331 IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

WHMIS classification

D2B - Toxic material causing other toxic effects

E - Corrosive material



Classification system

HMIS ratings (scale 0-4)

(Hazardous Materials Identification System)

HEALTH 3 Health (acute effects) = 3

FIRE 1 Flammability = 1

REACTIVITY 1 Physical Hazard = 1

Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances

CAS# Description:

376-06-7 Perfluorotetradecanoic acid

Identification number(s):

EC number: 206-803-4

4 First-aid measures

Description of first aid measures

General information Immediately remove any clothing soiled by the product.

After inhalation

Supply fresh air. If required, provide artificial respiration. Keep patient warm.

Seek immediate medical advice.

After skin contact

Immediately wash with water and soap and rinse thoroughly.

Seek immediate medical advice.

Product name: Perfluorotetradecanoic acid	
<div>After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor. After swallowing Seek medical treatment. Information for doctor Most important symptoms and effects, both acute and delayed Causes severe skin burns. Causes serious eye damage. Indication of any immediate medical attention and special treatment needed No further relevant information available.</div> <div>(Contd. of page 1)</div>	
5 Fire-fighting measures Extinguishing media Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam. Special hazards arising from the substance or mixture If this product is involved in a fire, the following can be released: Carbon monoxide and carbon dioxide Hydrogen fluoride (HF) Advice for firefighters Protective equipment: Wear self-contained respirator. Wear fully protective impervious suit.	
6 Accidental release measures Personal precautions, protective equipment and emergency procedures Wear protective equipment. Keep unprotected persons away. Ensure adequate ventilation Environmental precautions: Do not allow material to be released to the environment without proper governmental permits. Methods and material for containment and cleaning up: Use neutralizing agent. Dispose of contaminated material as waste according to section 13. Ensure adequate ventilation. Prevention of secondary hazards: No special measures required. Reference to other sections See Section 7 for information on safe handling See Section 8 for information on personal protection equipment. See Section 13 for disposal information.	
7 Handling and storage Handling Precautions for safe handling Keep container tightly sealed. Store in cool, dry place in tightly closed containers. Ensure good ventilation at the workplace. Information about protection against explosions and fires: No information known. Conditions for safe storage, including any incompatibilities Storage Requirements to be met by storerooms and receptacles: No special requirements. Information about storage in one common storage facility: Store away from strong bases. Store away from oxidizing agents. Further information about storage conditions: Keep container tightly sealed. Store in cool, dry conditions in well sealed containers. Specific end use(s) No further relevant information available.	
8 Exposure controls/personal protection Additional information about design of technical systems: Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute. Control parameters Components with limit values that require monitoring at the workplace: The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace. Additional information: No data Exposure controls Personal protective equipment General protective and hygienic measures The usual precautionary measures for handling chemicals should be followed. Keep away from foodstuffs, beverages and feed. Remove all soiled and contaminated clothing immediately. Wash hands before breaks and at the end of work. Avoid contact with the eyes and skin. Maintain an ergonomically appropriate working environment. Breathing equipment: Use suitable respirator when high concentrations are present. Recommended filter device for short term use: Use a respirator with type P100 (USA) or P3 (EN 143) cartridges as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards. Protection of hands: Impervious gloves Check protective gloves prior to each use for their proper condition. The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer. Penetration time of glove material (in minutes) Not determined Eye protection: Tightly sealed goggles Full face protection Body protection: Protective work clothing.	
9 Physical and chemical properties Information on basic physical and chemical properties General Information Appearance: Form: Powder	
<div>(Contd. on page 3)</div> <div>USA</div>	

Product name: Perfluorotetradecanoic acid

(Contd. of page 2)

Color: White
Odor: Not determined
Odor threshold: Not determined.
pH-value: Not applicable.

Change in condition
Melting point/Melting range: 130-132 °C (266-270 °F)
Boiling point/Boiling range: 192 °C (378 °F) (60mm)
Sublimation temperature / start: Not determined

Flash point: Not applicable
Flammability (solid, gaseous) Not determined.
Ignition temperature: Not determined
Decomposition temperature: Not determined
Auto igniting: Not determined.

Danger of explosion: Product does not present an explosion hazard.
Explosion limits:

Lower: Not determined
Upper: Not determined
Vapor pressure: Not applicable.
Density: Not determined
Relative density Not determined.
Vapor density Not applicable.
Evaporation rate Not applicable.

Solubility in / Miscibility with
Water: Insoluble
Partition coefficient (n-octanol/water): Not determined.
Viscosity:
dynamic: Not applicable.
kinematic: Not applicable.
Other information No further relevant information available.

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions Reacts with strong oxidizing agents
Conditions to avoid No further relevant information available.
Incompatible materials:
Oxidizing agents
Bases
Hazardous decomposition products:
Carbon monoxide and carbon dioxide
Hydrogen fluoride

11 Toxicological information

Information on toxicological effects
Acute toxicity: Swallowing will lead to a strong corrosive effect on mouth and throat and to the danger of perforation of esophagus and stomach.
LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: Causes severe skin burns.
Eye irritation or corrosion: Causes serious eye damage.
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: No effects known.
Carcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity: No effects known.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Subacute to chronic toxicity: No effects known.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Additional ecological information:
General notes:
Do not allow material to be released to the environment without proper governmental permits.
Avoid transfer into the environment.
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.



13 Disposal considerations


Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

UN-Number
DOT, IMDG, IATA UN3261
UN proper shipping name
DOT Corrosive solid, acidic, organic, n.o.s. (Perfluorotetradecanoic acid)

(Contd. on page 4)
USA

Product name: Perfluorotetradecanoic acid	
(Contd. of page 3)	
IMDG, IATA	CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S. (Perfluorotetradecanoic acid)
Transport hazard class(es)	
DOT	
	
Class	8 Corrosive substances.
Label	8
Class	8 (C4) Corrosive substances
Label	8
IMDG, IATA	
	
Class	8 Corrosive substances.
Label	8
Packing group	
DOT, IMDG, IATA	III
Environmental hazards:	Not applicable.
Special precautions for user	Warning: Corrosive substances
EMS Number:	F-A,S-B
Segregation groups	Acids
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
Transport/Additional information:	
DOT	
Marine Pollutant (DOT):	No
UN "Model Regulation":	UN3261, Corrosive solid, acidic, organic, n.o.s. (Perfluorotetradecanoic acid), 8, III

15 Regulatory information	
Safety, health and environmental regulations/legislation specific for the substance or mixture	
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)	
Hazard pictograms	
	
GHS05	
Signal word Danger	
Hazard statements	
H314 Causes severe skin burns and eye damage.	
Precautionary statements	
P260 Do not breathe dust/fume/gas/mist/vapours/spray.	
P303+P361+P353 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.	
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.	
P301+P330+P331 IF SWALLOWED: rinse mouth. Do NOT induce vomiting.	
P405 Store locked up.	
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.	
National regulations	
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.	
All components of this product are listed on the Canadian Non-Domestic Substances List (NDSL).	
SARA Section 313 (specific toxic chemical listings) Substance is not listed.	
California Proposition 65	
Prop 65 - Chemicals known to cause cancer Substance is not listed.	
Prop 65 - Developmental toxicity Substance is not listed.	
Prop 65 - Developmental toxicity, female Substance is not listed.	
Prop 65 - Developmental toxicity, male Substance is not listed.	
Information about limitation of use: For use only by technically qualified individuals.	
Other regulations, limitations and prohibitive regulations	
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006.	
This substance is included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH).	
The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.	
Substance is not listed.	
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.	
Chemical safety assessment: A Chemical Safety Assessment has not been carried out.	

16 Other information	
Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.	
Department issuing SDS: Global Marketing Department	
Date of preparation / last revision 11/23/2015 / -	
Abbreviations and acronyms:	
RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)	
IATA-DGR: Dangerous Goods Regulations by the "International Air Transport Association" (IATA)	
ICAO: International Civil Aviation Organization	
ICAO-TI: Technical Instructions by the "International Civil Aviation Organization" (ICAO)	
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)	
IMDG: International Maritime Code for Dangerous Goods	
DOT: US Department of Transportation	
IATA: International Air Transport Association	
EINECS: European Inventory of Existing Commercial Chemical Substances	
CAS: Chemical Abstracts Service (division of the American Chemical Society)	
HMIS: Hazardous Materials Identification System (USA)	
WHMIS: Workplace Hazardous Materials Information System (Canada)	
LC50: Lethal concentration, 50 percent	
LD50: Lethal dose, 50 percent	
vPvB: very Persistent and very Bioaccumulative	

Product name: Perfluorotetradecanoic acid	
ACGIH: American Conference of Governmental Industrial Hygienists (USA) OSHA: Occupational Safety and Health Administration (USA) NTP: National Toxicology Program (USA) IARC: International Agency for Research on Cancer EPA: Environmental Protection Agency (USA)	(Contd. of page 4)
USA	

SAFETY DATA SHEET

Version 6.2
Revision Date 07/16/2021
Print Date 10/24/2021

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : Perfluorotridecanoic acid

Product Number : 654973
Brand : Aldrich
CAS-No. : 72629-94-8

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-
527-3887 CHEMTREC (International) 24
Hours/day; 7 Days/week

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 4), H332
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 1B), H360
Effects on or via lactation, H362
Specific target organ toxicity - repeated exposure (Category 1), Liver, H372
For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Aldrich - 654973

Page 1 of 9

Hazard statement(s)	
H302 + H332	Harmful if swallowed or if inhaled.
H351	Suspected of causing cancer.
H360	May damage fertility or the unborn child.
H362	May cause harm to breast-fed children.
H372	Causes damage to organs (Liver) through prolonged or repeated exposure.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P263	Avoid contact during pregnancy/ while nursing.
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.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	: C ₁₃ HF ₂₅ O ₂
Molecular weight	: 664.11 g/mol
CAS-No.	: 72629-94-8
EC-No.	: 276-745-2

Component	Classification	Concentration
Perfluorotridecanoic acid		
	Acute Tox. 4; Carc. 2; Repr. 1B; Lact. ; STOT RE 1; H302, H332, H351, H360, H362, H372	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

Show this material safety data sheet to the doctor in attendance.

If inhaled

After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Water Foam Carbon dioxide (CO₂) Dry powder

Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Nature of decomposition products not known.

Combustible.

Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Avoid generation and inhalation of dusts in all circumstances. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling

Work under hood. Do not inhale substance/mixture.

Hygiene measures

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.
Storage class (TRGS 510): 6.1C: Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection

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

Skin protection

Handle with impervious gloves.

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatril® L

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatril® L

Body Protection

protective clothing

Respiratory protection

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure

Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|--|---|
| a) Appearance | Form: solid |
| b) Odor | No data available |
| c) Odor Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 112 - 123 °C (234 - 253 °F) - lit. |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | ()Not applicable |
| h) Evaporation rate | No data available |
| i) Flammability (solid, | No data available |

	gas)	
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	No data available
	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

no information available

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Acute toxicity estimate Oral - 500.1 mg/kg

(Expert judgment)

Acute toxicity estimate Inhalation - 4 h - 11.1 mg/l

(Expert judgment)

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

Causes serious eye damage.

Respiratory or skin sensitization

No data available

Germ cell mutagenicity

No data available

No data available

No data available

Carcinogenicity

Suspected of causing cancer.

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

May damage the unborn child.

Studies indicating a hazard to babies during the lactation period

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Causes damage to organs through prolonged or repeated exposure. - Liver

Aspiration hazard

No data available

11.2 Additional Information

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

After absorption:

gastric pain

Nausea

Vomiting

Drowsiness

somnolence

Handle in accordance with good industrial hygiene and safety practice.

SECTION 12: Ecological information

12.1 Toxicity

No data available

Toxicity to daphnia and other aquatic invertebrates	Remarks: No data available (Perfluorotridecanoic acid)
---	--

Toxicity to algae	Remarks: No data available (Perfluorotridecanoic acid)
-------------------	--

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

Discharge into the environment must be avoided.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

Further information

Not classified as dangerous in the meaning of transport regulations.

SECTION 15: Regulatory information**SARA 302 Components**

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

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

SARA 311/312 Hazards

No SARA Hazards

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Perfluorotridecanoic acid	CAS-No. 72629-94-8	Revision Date
---------------------------	-----------------------	---------------

New Jersey Right To Know Components

Perfluorotridecanoic acid	CAS-No. 72629-94-8	Revision Date
---------------------------	-----------------------	---------------

SECTION 16: Other information**Further information**

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

Copyright 2020 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only.

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.2

Revision Date: 07/16/2021

Print Date: 10/24/2021



TCI AMERICA

SAFETY DATA SHEET

Page 1 of 5

Revision number: 2
Revision date: 10/06/2014

1. IDENTIFICATION

Product name: Heneicosaf fluoroundecanoic Acid
Product code: H1234

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborage Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Skin Corrosion/Irritation [Category 2]
Eye Damage/Irritation [Category 2A]

Signal word: Warning!

Hazard Statement(s): Causes serious eye irritation
Causes skin irritation

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

[Prevention]
[Response]

Wash hands and face thoroughly after handling. Wear protective gloves. Wear eye and face protection.
If on skin: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention.

[Storage]
[Disposal]

None
None

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance
Components: Heneicosaf fluoroundecanoic Acid
Percent: >97.0%(GC)(T)
CAS Number: 2058-94-8
Molecular Weight: 564.09
Chemical Formula: C₁₁HF₂₁O₂
Synonyms: Perfluoroundecanoic Acid

4. FIRST-AID MEASURES

Inhalation:	Call a poison center or doctor if you feel unwell. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Skin contact:	If skin irritation occurs get medical advice/attention. Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Eye contact:	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Ingestion:	Do not induce vomiting without medical advice. If swallowed, seek medical advice immediately and show the container or label. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Symptoms/effects:	
Acute:	Redness.
Delayed:	No data available
Immediate medical attention:	If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO₂, sand, earth, water spray or regular foam Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical

Hazardous combustion products: These products include: Carbon oxides Halogenated compounds

Other specific hazards: WARNING: Highly toxic HF gas is produced during combustion.

Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
Personal protective equipment:	Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).
Emergency procedures:	Prevent dust cloud. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and exercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material.

Environmental precautions:

Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling:	Avoid inhalation of vapor or mist. Avoid contact with skin and eyes. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.
Conditions for safe storage:	Keep only in the original container in a cool well-ventilated place. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.
Storage incompatibilities:	Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits:	No data available
-------------------------	-------------------

Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection:	Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection:	Nitrile gloves.
Eye protection:	Safety glasses.
Skin and body protection:	Lab coat.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C):	Solid
Form:	Crystal - Powder
Color:	White - Almost white
Odor:	No data available
Odor threshold:	No data available

Melting point/freezing point:	101°C (214°F)	pH:	No data available
Boiling point/range:	160°C (320°F)/8kPa	Vapor pressure:	No data available
Decomposition temperature:	No data available	Vapor density:	No data available
Relative density:	No data available	Dynamic Viscosity:	No data available
Kinematic Viscosity:	No data available		
Partition coefficient: n-octanol/water (log P_{ow})	No data available	Evaporation rate: (Butyl Acetate = 1)	No data available

Flash point:	113°C (235°F)	Autoignition temperature:	No data available
Flammability (solid, gas):	No data available	Flammability or explosive limits:	
		Lower:	No data available
		Upper:	No data available

Solubility(ies):

10. STABILITY AND REACTIVITY

Reactivity:	Not Available.
Chemical Stability:	Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions:	No hazardous reactivity has been reported.
Conditions to avoid:	Avoid excessive heat and light.
Incompatible materials:	Oxidizing agents
Hazardous Decomposition Products:	No data available

11. TOXICOLOGICAL INFORMATION

Acute Toxicity:
No data available

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:

No data available

IARC: No data available

NTP: No data available

OSHA: No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Skin contact may result in redness, pain or dry skin. Eye contact may result in redness or pain.

Potential Health Effects:

Skin and eye contact may result in irritation.

Target organ(s): No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

Persistence and degradability:	No data available
Bioaccumulative potential (BCF):	1400 - 3500 (conc. 1 ug/L), 1300 - 5300 (conc. 0.1 ug/L)
Mobility in soil:	No data available
Partition coefficient:	No data available
n-octanol/water (log P_{ow})	
Soil adsorption (K_{oc}):	No data available
Henry's Law:	No data available
constant (PaM³/mol)	

13. DISPOSAL CONSIDERATIONS

Disposal of product:	Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container:	Dispose of as unused product. Do not re-use empty containers.
Other considerations:	Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)	Non-hazardous for transportation.
IATA	Non-hazardous for transportation.
IMDG	Non-hazardous for transportation.

15. REGULATORY INFORMATION**Toxic Substance Control Act (TSCA 8b.):**

This product is NOT on the EPA Toxic Substances Control Act (TSCA) inventory. The following notices are required by 40 CFR 720.36 (C) for those products not on the inventory list:

- (i) These products are supplied solely for use in research and development by or under the supervision of a technically qualified individual as defined in 40 CFR 720.0 et sec.
- (ii) The health risks of these products have not been fully determined. Any information that is or becomes available will be supplied on a SDS sheet.

US Federal Regulations**CERCLA Hazardous substance and Reportable Quantity:**

SARA 313:	Not Listed
SARA 302:	Not Listed

State Regulations**State Right-to-Know**

Massachusetts	Not Listed
New Jersey	Not Listed
Pennsylvania	Not Listed
California Proposition 65:	Not Listed

Other Information**NFPA Rating:**

Health:	1
Flammability:	0
Instability:	0

HMIS Classification:

Health:	1
Flammability:	0
Physical:	0

International Inventories

WHMIS hazard class:	D2B: Materials causing other toxic effects. (Toxic)
EC-No:	218-165-4

16. OTHER INFORMATION

Revision date: 10/06/2014

Revision number: 2

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.



APPENDIX F
HOSPITAL INFORMATION, MAP AND
FIELD ACCIDENT REPORT



FIELD ACCIDENT REPORT

This report is to be filled out by the designated Site Safety Officer after EVERY accident.

PROJECT NAME _____ PROJECT. NO. _____

Date of Accident _____ Time _____ Report By _____

Type of Accident (Check One):

☐ Vehicular ☐ Personal ☐ Property

Name of Injured _____ DOB or Age _____

How Long Employed _____

Names of Witnesses _____

Description of Accident _____

Action Taken _____

Did the Injured Lose Any Time? _____ How Much (Days/Hrs.)? _____

Was Safety Equipment in Use at the Time of the Accident (Hard Hat, Safety Glasses, Gloves, Safety Shoes, etc.)? _____

(If not, it is the EMPLOYEE'S sole responsibility to process his/her claim through his/her Health and Welfare Fund.)

INDICATE STREET NAMES, DESCRIPTION OF VEHICLES, AND NORTH ARROW



TYLL ENGINEERING & CONSULTING PC

HOSPITAL INFORMATION AND MAP

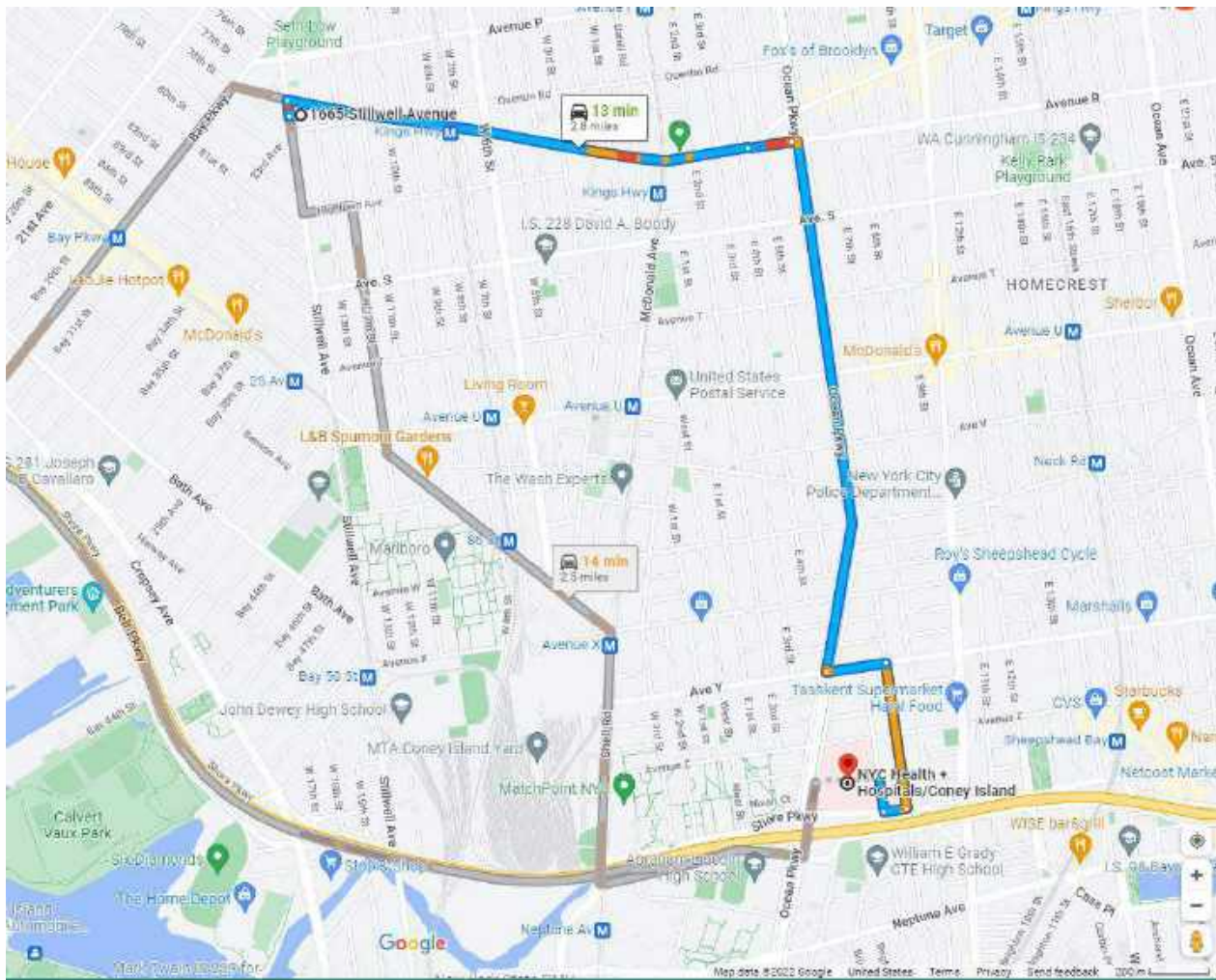
The hospital nearest the site is:

Coney Island Hospital Emergency Department

2601 Ocean Parkway, Brooklyn, NY 11235

718-616-4327

Figure 1 – Directions



START

1. Head west toward Stillwell Ave
2. Take Kings Hwy and Ocean Pkwy to Hubbard St
3. Take right onto Hubbard St
4. Hubbard St turns right and becomes Ocean Shore Pkwy
5. Turn right onto E 6th St
6. NYC Health + Hospitals/Coney Island is on the left

2601 Ocean Parkway, Brooklyn, NY 11235

END

Appendix G

Project Team Resumes



Karen G. Tyll, P.E.

President

Fields of Competence

Ms. Tyll applies her knowledge of civil and environmental engineering to remediation design, stormwater management, forensic investigations, environmental compliance, and environmental permitting/compliance. Ms. Tyll's background is an interesting mix of remedial design, site grading, drainage and utility design, environmental investigations, forensic engineering, and permitting/regulatory compliance.

Experience Summary

Twenty five years of experience: President with Tyll Engineering and Consulting PC, Senior Engineer with J.R. Holzmacher, PE LLC, Senior Engineer with Roux Associates, Inc./Remedial Engineering, P.C.; Senior and Project Engineer at P.W. Grosser Consulting; Project Engineer at Vollmuth & Brush; Project Engineer at Anderson & Associates.

Credentials

B.S.C.E., Civil Engineering with Environmental Option, Virginia Tech

Professional Engineer: New York (079520), North Carolina (044315), Florida (81892)

OSHA Health & Safety 40 Hour Training and 8 hour annual refresher.

NYC OER Turbo Training Gold/Bronze Certification

NYC OER Brownfield Incentive Grant Qualified Vendor

Professional Affiliations

American Society of Civil Engineers

National Society of Professional Engineers

Society of Women Engineers, Section Treasurer 1999-2002

Society of Women Engineers, Section President, 2002-2005

Engineers Joint Committee of Long Island, Rube Goldberg Contest Chair

Key Projects

Remediation:

- Providing professional engineering services to assist other environmental consulting firms' clients and directly to land owners to fulfill needs for PE involvement with NYSDEC, NYCOER, and NYCDEP driven projects.
- Completed inspection of Vapor Barrier system (VBS) design and inspection of the installation and Sub-slab Depressurization System (SSDS) design

and inspection. Train and troubleshoot the installation of VBS with Contractors.

- Completed outdoor, ambient, and sub-slab air sampling for office building with passive SSDS in Melville, NY. Completed design to turn passive system to active system, completed necessary reports, and supported consent order issues.
- Project Manager to complete investigation and remediation at historic aircraft part facility in New Jersey. Oversaw staff that completed multiple, large sampling events, test pits, and reporting to the NJDEP.
- Project Manager on multiple remediation sites requiring investigations, tank removals, remedial action activities, compliance reporting, and monitoring.

Stormwater Experience:

- Senior Engineer to design stormwater collection structures during design upgrades to 10 acres of an existing storm drain system at a former fuel terminal in Buffalo, New York. Responsible for laying out system, selecting sizes based upon angles and minimum distances between pipes.
- Senior Engineer to design an alternative Part 360 cap for an industrial landfill near Albany, New York. The cap incorporated lined swales and ponds, trees planted for phytoremediation purposes. An education center was also designed for the Site and was responsible for designing a cistern system that would capture both rainwater and treated effluent from a groundwater treatment system.
- Project Engineer to complete a computer hydraulic model and evaluation of a stormwater collection system at a national laboratory facility in Upton, NY. The storm drain study included multiple modeling and design scenarios to evaluate flood reduction. Potential solutions included the installation of additional dry wells and the removal of paved parking areas to increase infiltration.
- Senior Engineer to design a second overflow weir which would help to regulate the height of water in a stormwater wetland, to provide an additional outfall to prevent flooding, and to revegetate a wetlands area in the receiving creek. This project involved the evaluation of the 12 square mile watershed area that contributed to the stormwater wetland, the design of the weir structure, apron, and spillway to route the water between two bridge abutments, and the



analysis to determine the height of water over each of the weirs during various storm events.

- Senior Engineer to complete multiple smaller investigations regarding stormwater management at residential, commercial, and industrial facilities.
- Senior Engineer to complete multiple Stormwater Pollution Prevention Plans (SWPPP) and their required inspections. Completed multiple State Pollution Discharge Elimination System (SPDES) permit packages for new systems and modifications.

Forensic Engineering/Expert Witness:

- Engineer to complete over two hundred post-storm forensic investigations from 2011 to the present to assist insurance companies in assigning coverage to Insureds. Responsible for determining cause and origin of damage and wind vs. water determinations in flooding situations.
- Engineer to complete multiple residential and commercial forensic investigations not related to storms. Claim matters included stormwater drainage from off-site sources causing flooding, wood floor damage, pipe breaks, and pool failure (both gunite and vinyl lined).
- Have been involved with multiple cases as expert witness where the subject of the claims are SuperStorm Sandy, environmental contamination, or personal injury related.

Permitting/Compliance:

- Project Manager for providing engineering and environmental services to four machining facilities that specialize in the manufacturing of parts for aircraft. Responsible for completing Suffolk County Department of Health Services toxic and hazardous waste storage permits, assisting with RCRA Hazardous Material storage issues and reporting, preparing and participating in SCDHS variance hearing, strategizing with client to come up with best solutions for the facility permits, completing Emergency Action Plan and SPCC Plans, providing training for employees as required by the SPCC Plan, revising the SPCC plans when required due to facility changes or ownership changes, assisting in with follow up tasks from in house third party audits, and assisting facility environmental personnel with day-to-day issues.
- Interim Environmental Health and Safety (EHS) Officer for large laboratory/R&D facility

undergoing large construction project. Acted as EHS Officer by being onsite two days a week and being available by phone and email, when not on-site. Was responsible for maintaining compliance with local, state and federal compliance and reporting requirements, reviewing chemicals, attending construction meetings, completing Stormwater Pollution Prevention Plan (SWPPP) inspections, completing a State Pollution Discharge Elimination System (SPDES) modification, participating in an ISO 14001 audit, interfaced with laboratory and facility personnel to complete internal projects, completed bi-weekly construction safety inspections, and provided facility with strategy regarding compliance needs for both long term and short term. Completed SPCC Plan revisions and training for facility.

- Senior Engineer to complete the facility's air facility registration form and accompanying data for their Hauppauge, NY location. Responsibilities included completing a site visit, preparing a spreadsheet to compute the facility emissions, preparing a site plan of the facility including the emissions points, interfacing with the client, facility contact, and regulator.
- Senior Engineer to complete state facility permit modification for bulk fuel supplier in Westchester, NY. Responsibilities included devising methodology for determining VOC emissions previously used in permit due to former gasoline operations, preparing complex spreadsheet for multiple alternatives, reviewing the current permit to verify that all current conditions are beneficial to the Client, provided professional engineering requirements for the submittal, coordinating with NYSDEC case manager and prepare responses to comments from NYSDEC.
- Environmental Compliance Audit team member for numerous healthcare facilities in New York. Coordinated with the facilities' environmental staff to develop audit scope of work and reporting format. Assessed facilities' compliance with federal, state and local regulations including CAA, CWA, EPCRA, RCRA, SARA Title III, and TSCA. A specialized software tool, Dakota Auditor, was utilized to help complete the audits and to stay abreast of the changing regulations.
- Project Manager for the completion of the Emergency Planning and Community Right-to-Know Act's (EPCRA) Toxic Release Inventory (TRI) reporting for nine, airport-based, aviation-



fueling facilities as required by the USEPA for the reporting years 1998 - 2001. The project included the identification and quantification of chemical and petroleum usage at each facility, a review of the facility's MSDS sheets, and the determination of the threshold levels of each of the EPCRA Section 313-listed chemicals found in the fuel. Tank and fugitive emissions were calculated using the tank and fueling system information supplied by the client. Stormwater discharge quantities were calculated and reported using analytical data. The resulting information was compiled, and the necessary forms were completed.

- Project Manager to complete SPCC Plan for individual Manhasset hospital in major healthcare system on Long Island. Completed original SPCC plan in 2006 and then was asked to complete revision in 2018.
- Project Engineer to complete a Facility Response Plan (FRP) to be submitted and approved by the USEPA for an aviation fueling facility in San Juan, Puerto Rico. The FRP preparation included a site visit to collect site data, review of the applicable regulations, and preparation of site, evacuation, and drainage drawings.
- Senior Engineer to complete the joint permit application and associated documents for a maintenance dredging project in a small incorporated village on the north fork of Long Island. Tasks included digitally determining dredging volumes, preparing sediment sampling plan, preparing site drawings, preparation of application and associated documents, and coordination with agencies, Owners, and contractors.

Project Management

- Project Manager for a comprehensive audit program for an airport services company with locations in the United States and Canada. The audits covered environmental, health and safety aspects of the operations (fueling, maintenance, food services). Responsibilities included interfacing with the client and attorneys, devising an audit report template, coordinating team deployments, review audit findings and audit reports, and supported follow up work to resolve findings.
- Senior Engineer to oversee installation of a sub-slab depressurization system on a former manufacturing facility in Hicksville, New York. Responsible for overseeing the survey completed

before the initial indoor, outdoor and sub-slab testing.

- Project Manager for the design and construction management of a new filtration system for the jet fuel to be stored at the bulk fuel storage facility at a NYC airport. The project included preparation of detailed design drawings and specifications, which included piping schematics, system layout plans, concrete design, and system details in accordance with NYC building code and the Port Authority of New York and New Jersey's requirements.

Design Experience:

- Senior Engineer responsible for the design of retention pond to be constructed inside former industrial lagoons to store stormwater from the former industrial facility near Albany, New York. The project included the optimization of the design (varying shape, slopes, and depths) to provide the necessary volume of storage for a 25 year 24 hour storm, overseeing the preparation of the specifications, coordinating with the landscape architects, and completing volume calculations to determine the different quantities of soil needed for the bid documents.
- Senior Engineer for the design of stormwater and sanitary sewers at and around a former fuel terminal in Brooklyn, New York. Responsible for laying out the existing utilities confirming their locations using over a hundred paper maps and laying out the proposed piping as per New York City Department of Environmental Protection
- Project Engineer responsible for completing the site and utility design for the first phase of athletic fields, the associated parking lots, and access road for a private school being built on the East End of Long Island. The project included the coordination with the architects, contractors, the owner's representatives, and local governmental agencies. Responsibilities also included the design and planning of the associated traffic controls, water supply, drainage, and sanitary systems.

Dhanraj D. Singh

251 Vincent Drive | East Meadow, NY 11554 | 347-728-0768 | ghanrajdsingh@gmail.com

Objective

To find a challenging career in an established organization so that I may grow professionally, while earning a good reputation amongst my peers.

PROFESSIONAL EXPERIENCE

DC Environmental Services, Inc. (*Brooklyn, NY*)

2004 - 2015

- Managed the operations and productivity of the division of environmental remediation
- Performed and prepare Environmental Phase I and II (ESA) reports
- Planning, coordinating and implementation of environmental Phases I, II and III
- Preparation and review of Closure Reports for BCP/VCP/Rezoned development projects
- Preparation of Site-Specific Health and Safety Plans
- Preparation of Remedial/Corrective Action Plans
- Oversight/implementation of Site-Specific Health and Safety Plans with job oversight, toolbox meetings
- Environmental Site Assessments and Remediation Costing
- Direct communicational with clients, Case Managers of NYSDEC, NYCDEP & NYCOER
- Performed Geoprobe investigations and Ground Penetrating Radar survey
- Collection of soil, groundwater and soil gas samples; performed field-screening
- Collection of Asbestos sampling; prepare inspection reports based on findings

BSD Environmental Group (*Brooklyn, NY*)

2015 - 2018

D.b.a. RSK Environmental Group (*Brooklyn, NY*)

2018 - present

- Managed the operations and productivity
- Perform Environmental Phase I and II (ESA) reports
- Planning, coordinating and implementation of environmental Phases I, II and III
- Preparation and review of Closure Reports for BCP/VCP/Rezoned development projects
- Preparation of Site-Specific Health and Safety Plans
- Preparation of Remedial/Corrective Action Plans
- Oversight and implementation of Site-Specific Health and Safety Plans; job oversight, toolbox meetings
- Environmental Site Assessments and Remediation Costing
- Direct communicational with clients, Case Managers of NYSDEC, NYCDEP & NYCOER
- Performed Geoprobe investigations and Ground Penetrating Radar survey
- Collection of soil, groundwater and soil gas samples; performed field-screening
- Collection of Asbestos sampling; prepare inspection reports based on findings
- Perform Lead-based paint survey.

EDUCATION

NYC College of Technology (*Brooklyn, NY*)

2008

St. Georges College & School of Business and Computer Science (*Trinidad, W.I.*)

1990 - 1999

Certification and Training

2005 - 2022

- 62 Hour SST Supervisor approved by New York City Department of Buildings
- 30 Hour OSHA Construction Safety and Health - 29 CFR 1926
- 40 Hour plus annual refresher - OSHA HAZWOPER 29 CFR 1910.120
- 8 Hour plus annual refresher - OSHA HAZWOPER Site Supervisor 29 CFR 1910.120(e)(4)
- NYSDOL Asbestos Inspector
- OSHA Confined Space Awareness - 29 CFR 1910.146
- 4-Hour Supported Scaffolding Safety - 29 CFR 1926.451
- Mold Inspection and Assessment
- Lead-based Paint Inspector EPA - TSCA Section 402/40 CFR Part 745.226
- EPA Lead Safe Certified Renovator
- NYSDEC Class A/B Operator - 6 NYCRR 613.25 & 6 NYCRR 598.12
- Mt. Vernon Fire Department - Supervise and/or install oil burner equipment
- Yonkers Fire Department - Tank Pump Installer Permit
- NCDOH Certificate of Fitness - Article 12, Section 1.9(j) Tank Installer/Remover

DRUMITA GABRIEL DMELLO

dgdmello389@gmail.com | +1(646)249-6129 | www.linkedin.com/in/drumita-dmello/

A proficient Environmental Consultant reflecting skillful individuality in solo and team projects, and dedication to a career with an ability to adapt to new situations and grasp new software/techniques. 3+ years of experience in the capacity of an Environmental Consultant within a dynamic workspace. Directly led several NYS & NYC projects assigned in Voluntary Cleanup Program (VCP) and Brownfield Cleanup Program (BCP) from the initial stage of Phase-I Site Assessment to the final stage (Phase-III) of Remedial Cleanup and reporting.

EDUCATION

University of New Haven, West Haven, CT	May 2020
Master of Science, Environmental Science	GPA: 3.73/4
Concentration: Geographical Information Systems (GIS)	
St. Xavier's College, Ahmedabad, Gujarat	April 2017
Bachelor of Science, Chemistry	GPA: 7/10

WORK EXPERIENCE

RSK Environmental Group LLC: Environmental Consultant

October 2020 – Present

- Experience in preparation of Environmental Assessment Reports (Phase 1, 2, 3) in compliance with NYS & NYC Environmental Rules & Regulations (NYSDEC Part 375 and DER-10).
- Management of cost estimation, and budgeting during the initiation of a project along with efficient client organization and sub-contractor communication and oversight during field activities.
- Implementing project work plans and on-site health and safety monitoring during site activities.
- Reading engineering plans and creating remedial investigation and remedial action diagrams utilizing AutoCAD 2022.
- Organizing staff briefing, and safety procedure run-through prior to field activities.
- Oversight and handling of soil samples, collection of samples utilizing spoons/macro-core liners in lab-provided glassware; groundwater collection utilizing grab sample technique/low-flow pumps and air sample collection utilizing 2 and 8-hour flow controllers.
- Participation in NY state and city staff meetings, project planning, and conflict resolution.
- Planning and compiling technical reports (Phase-I Reports, Remedial Investigation work plans and reports (RIWP, RIR), Remedial Action Work plans and reports (RAWP, RAR), Site Characterization Report (SCR), Tank Closure Reports (TCR) and Spill Closure Reports for local clients, city, and state projects.

Walkspan, Inc.: GIS and Data Specialist

August 2020 – July 2021

- Collected and projected GIS data according to a particular coordinate system in ArcGIS Pro, QGIS and ArcGIS Map Products & Online for map-making and feasibility analysis.
- Analyzed the GIS data for Urban mapping of three (3) US cities, namely New York City, Seattle, and Phoenix.
- Designed ArcGIS Story Map for the city of Seattle to showcase the importance and reach of sidewalks.
- Designed web viewing applications utilizing ArcGIS Online to outline the overall idea of Walkability for New York City.

City of West Haven, Mayor's Office: Sustainability Intern

June 2019 – August 2019

- Achieved “Bronze” certification of sustainable town for West Haven awarded by Sustainable CT and worked with the municipal team to plan and analyze the city management and zoning documents.
- Created outlined professional GIS Web Maps for the City of West Haven as inventories for Open Spaces, Brownfield Sites, and Natural Resources using Web GIS and ArcGIS.
- Exercised remote work to gain knowledge about the city’s demographics, Natural Diversity, present Environmental Protection Laws, and city placemaking projects and ideas.

ADDITIONAL

- **Technical Expertise:** Environmental Impact Site Assessments and reports, OSHA, USEPA RCRA, CERCLA, NYSDEC Rules and Regulation, NYC Rules and Regulations, Environmental Pollution Dynamics, Toxicology, and Chemistry.
- **Certification:** Associate Project Management, 8-hour OSHA HAZWOPER Refresher, 8-hour OSHA Supervisor Initial.

Appendix H

Notice of Significant Threat



KATHY HOCHUL
Governor

Department
of Health

JAMES V. McDONALD, M.D., M.P.H.
Commissioner

MEGAN E. BALDWIN
Acting Executive Deputy Commissioner

August 23, 2023

Heidi Dudek, P.E.
Division of Environmental Remediation
NYS Dept. of Environmental Conservation
625 Broadway
Albany, NY 12233

Re: **Significant Threat Determination**
1665 Stillwell Ave.
Site # C224307
Brooklyn, Kings County

Dear Heidi Dudek,

We reviewed available information including the October 2022 *Remedial Investigation Report* for the above-referenced site. Based on that review, I understand on-site soils are contaminated with petroleum-related volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals. Groundwater has VOCs, as well as perfluorooctanoic acid (PFOA) at concentrations exceeding their respective Class GA Ambient Water Quality Standards (AWQS) and the Maximum Contaminant Level (MCL) (drinking water standard). Soil vapor at the site is contaminated with both chlorinated and petroleum-related VOCs.

The site is fenced, and people will not come in contact with contaminated soils unless they dig below the surface materials. People are not drinking the contaminated groundwater because the area is served by a public water supply that is not affected by this contamination. Soil vapor intrusion is not a current concern, as there are no buildings on-site. Environmental sampling indicates soil vapor intrusion from site-related contaminants is not a concern off-site. I understand that a community air monitoring plan will be in place to address the potential for exposures during remedial activities and that any redevelopment will be conducted in a manner that is protective of public health.

Based on the information provided to date, and the lack of a complete exposure pathway to site-related contaminants I do not believe this site represents a significant threat to public health. If you have any questions or if you would like to discuss this site further, please contact me at (518) 402-7874.

Sincerely,

Scarlett Messier-McLaughlin, P.G.
Chief, Regions 2 and 7
Bureau of Environmental Exposure Investigation

ec: C. Vooris / A. Perretta / e-File
E. Wiegert – NYSDOH MARO
M. Little – NYC DOHMH
M. Medwid – NYSDEC Central Office
J. O'Connell – NYSDEC Region 2