



REMEDIAL ACTION WORKPLAN

For:

**1510 Broadway, LLC
Site #C224280**

**1510 Broadway Dry Cleaner Site
Brooklyn, New York**

Prepared for:

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CERTIFICATIONS

I, Fuad Dahan, certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 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)

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NYS Professional Engineer
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01/11/2021

Date



Signature

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LIST OF ACRONYMS

Acronym	Definition
AWQS	Ambient Water Quality Standards
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
bgs	Below ground surface
CAMP	Community Air Monitoring Plan
COC	Contaminant of Concern
cy	Cubic yard
DER	Division of Environmental Remediation
DER-10	NYSDEC Technical Guidance for Site Investigation & Remediation
DUSR	Data Usability Summary Report
ECs	Engineering Controls
ECL	Environmental Conservation Law
EIS	Environmental Impact Statement
ESA	Environmental Site Assessment
FER	Final Engineering Report
ICs	Institutional Controls
MSL	Mean Sea Level
MW	Monitoring Well
NYSDEC	New York State Department of Environmental Conservation
PAH	Polyaromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PHC	Petroleum Hydrocarbon

Acronym	Definition
PID	Photoionization Detector
QAPP	Quality Assurance Project Plan
RA	Remedial Action
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RECs	Recognized Environmental Concerns
RI	Remedial Investigation
RIR	Remedial Investigation Report
RIWP	Remedial Investigation Work Plan
SCG	Standards, Criteria, and Guidance
SCO	Soil Cleanup Objectives
SESI	SESI Consulting Engineers, DPC
SEQRA	State Environmental Quality Review Act
SMP	Site Management Plan
SoMP	Soil Management Plan
SVOCs	Semi-Volatile Organic Compounds
TAGM	Technical and Administrative Guidance Memorandum
TAL	Target Analyte List
TOGS	Technical and Operations Guidance Series
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds
WCDOH	Westchester County Department of Health

EXECUTIVE SUMMARY

The 1510 Broadway Dry Cleaner Site (herein referred to as the “Site”) was accepted into the New York Brownfield Cleanup Program (BCP) by the New York Department of Environmental Conservation (NYSDEC) pursuant to execution of a Brownfield Cleanup Agreement (“BCA”) on November 7, 2018 (BCP Site No. C224280). The Site is a vacant parcel covered by gravel, dirt and overgrown vegetation. The Site topography is generally level and flat and includes 0.4605 acres. The Site is irregularly shaped and is bounded on the north by Jefferson Avenue, on the northeast by Broadway and the elevated Metropolitan Transit Authority (MTA) railroad tracks, beyond which lie commercial properties; on the south by Hancock Street, beyond which lie a medical center and residential properties; and to the west by the Saratoga Avenue beyond which lie residential properties. There is also a two-story building bordering the southwest portion of the Site.

The proposed development consists of an eight-story structure with a cellar. The cellar will contain car parking, mechanical spaces, and building storage. The first floor (street level) will contain commercial retail space, a residential lobby, five residential units, a residential recreational area, laundry and bike rooms, offices, and additional mechanical and building storage rooms. Residential units will occupy the second through eighth floors, with an exterior residential recreation courtyard proposed on the second floor. The planned building construction will occupy nearly the entire Site leaving approximately 0.02 acres of landscaped area in the eastern-most portion of the Site.

The Site has been impacted by Contaminated historic fill which was also identified at the Site.

The Remedial Investigation Report (RIR) summarizes the results of prior investigations and the Remedial Investigation (RI) performed on the Site and characterizes the nature and extent of contamination for a future remedial action. The RI was conducted in accordance with the RI Work Plan (RIWP), which was last revised February 27, 2019, and approved by the NYSDEC in February 28, 2019. The RI was conducted in substantial conformance with the NYSDEC Technical Guidance for Site Investigation and Remediation (DER-10).

The RI was conducted in May and June of 2019 and included the installation of sixteen (16) soil borings advanced to twenty (20) feet below ground surface (ft. bgs), eleven (11) test pits advanced to 17 ft. bgs, nine (9) groundwater monitoring wells screened at varying depths,

and twelve (12) soil vapor sampling points advanced to 15 ft. bgs. The installed groundwater monitoring wells include six (6) wells installed during the June 2019 field effort and three (3) off-site wells installed in February 2020 per the NYSDEC request after review of the first draft RIR submitted. In addition, three (3) pre-existing wells installed by AKRF during the Phase II were sampled. A total of seventy-three (73) soil samples, twelve (12) groundwater samples, and twelve (12) soil vapor samples (with an ambient air sample) were collected during the investigation.

Soil samples were collected from Areas of Concern (AOCs) that were based on Recognized Environmental Conditions (RECs), identified in a Phase I Environmental Site Assessment (ESA) Report and RIR prepared by AKRF Inc. (AKRF). Also, the AOCs were based on the Geotechnical Engineering Report prepared by SESI, and a review of the Site history and field observations.

The AOC locations were used to select soil sample locations. The AOCs include a former on-site dry cleaner and other manufacturing operations, the presence of demolition debris and historic fill, and potential off-site industrial, automotive and dry-cleaning sources that could be impacting the Site.

Soil and groundwater samples were analyzed for a combination of full target compound list (TCL) and target analyte list (TAL) analytes – which include metals (USEPA Methods 6010/7471), volatile organic compounds (VOCs-USEPA Method 8260) semi-volatile organic compounds (SVOCs – USEPA Method 8270), PCBs, pesticides (USEPA Methods 8081/8082),

1,4-dioxane and polyfluorooctanoic acid (PFAS - modified EPA Method 537). Supplemental groundwater samples were analyzed for VOCs-USEPA Method 826 only. Duplicates were collected for every twenty samples collected and trip blanks accompanied all samples analyzed for VOCs.

In addition to the environmental investigation, SESI conducted a geotechnical investigation for construction design purposes in August 2018. Based on the geotechnical investigation, which included borings to a depth of 100 ft bgs, the depth of historic fill material varies across the Site, from five (5) to 21 ft. bgs. The historic fill material is underlain with a sand layer that extended to at least 100 ft. bgs the maximum depth of the borings.

Pesticides and polychlorinated biphenyls (PCBs) were identified at concentrations in soil exceeding the Unrestricted Use Soil Cleanup Objectives (USCO). Polycyclic aromatic

hydrocarbons (PAHs), and metals were identified at concentrations in soil exceeding the USCO and Restricted Residential SCO (RRSCO). PAHs and metals are present throughout the site within the historic fill.

The historic fill layer at the Site is impacted above the USCO and the RRSCO. Vertical soil contaminant delineation was achieved during this RI. In nine (9) boring out of the sixteen (16) vertical delineation was confirmed with a sample that meet the USCO levels. The samples collected within native soils exhibited concentrations below the or just exceeded the USCOS. Because of the low-level exceedances and the decreasing trend vertically, the vertical delineation is considered complete at or just below the native soil layer. Figure 1 of the RIR, which includes SESI geotechnical investigation, shows the approximate depth of the historic fill at test locations throughout the Site.

The Site groundwater which was gauged at an approximate depth of 35 to 36 ft. bgs during the June 2019 RI, has been impacted with VOCs and metals at concentrations exceeding the NYSDEC Technical Operational Guidance Series (TOGS) 1.1.1 GA Ambient Water Quality Standards (AWQS). Dissolved chlorinated VOCs (CVOCs), specifically tetrachloroethylene (PCE), was detected in 9 of 12 wells and was confirmed in a duplicate sample. All VOCs are in low dissolved concentrations; no free product was encountered or observed in any well or at any test location.

The Site soil vapor has been impacted by VOCs including 1,3-butadiene, acetone, benzene, carbon disulfide, chloroform, chloromethane, cyclohexane, methyl ethyl ketone, n-heptane, n-hexane, tetrachloroethylene, toluene, trichloroethene, and trichlorofluoromethane.

1.0 INTRODUCTION

The NYSDEC has entered into a BCP Agreement BCA Index No. C224280-10-01 for the site known as 1510 Broadway Dry Cleaner Site (BCP Site. # C224280) (“Site”) with BCP Volunteer

1510 Broadway LLC (the “Volunteer”) on November 7, 2018. The Site is located at 1510

Broadway in the Borough of the Brooklyn, Kings County, New York. SESI prepared this Remedial Action Work Plan (RAWP) for the remediation of the Site on behalf of the Volunteer. This RAWP includes an analysis of the remedial alternatives available to remediate the contamination as reported in the RIR dated May 2020, and then selects a preferred remedy.

The RI was conducted during May and June of 2019. A supplemental groundwater investigation was conducted in February 2020 as requested by the DEC as a comment on the first draft RIR (August 2019). The RI was completed in accordance with the NYSDEC Technical Guidance for Site Investigation and Remediation (DER-10), to provide a systematic assessment of environmental conditions on the Site. The RI defines the nature and extent of contamination on-Site, identifying contaminant source areas, and producing data of sufficient quantity and quality to complete an on-site exposure assessment and a qualitative off-site exposure assessment for purposes of designing the remedial action for the Site.

1.1 Site Location and Description

The Site property is identified on the city tax map as Block 1489, Lot 11. The Site was formerly known by the addresses 7 Saratoga Avenue and 1510-1524 Broadway, Brooklyn, NY (Tax Block 1489, Lots 6, 11, 12, 13, 14, 15, 16, 17, 18). The current address is 1510 Broadway and is situated in the Bedford-Stuyvesant / Brownsville section of Brooklyn, New York. The Site is approximately 0.4605-acres, which has been historically utilized for industrial and commercial purposes including dry-cleaning and printing operations. A Site Location map is presented as **Figure 1.1**. A Site Plan is presented as **Figure 1.2**.

The Site was formerly occupied by fifteen commercial buildings that were demolished between 1976 and 1987. Documented historic operations included a dry cleaner operated at 7 Saratoga Avenue from approximately 1949 to 1965. Additionally, Sanborn maps identified unspecified manufacturing at 1510 Broadway in 1962 and City Directories identified an apparent cleaning and dyeing facility at 1520 Broadway in 1928, a dress house/dress manufacturer at 1520 Broadway in 1934, a printer at 1516 Broadway in 1934, and watch and jewelry repair at 1510 Broadway in 1949. The locations of these former on-site facilities are presented on the Historic Operations Plan **Figure 2.1**.

The Site's average topographic elevation is approximately 40-feet above mean sea level (msl). Site topography is relatively level and is located in an urban area.

There are no surface water bodies or streams on or directly adjacent to the Site. SESI did not observe any areas suspected to be wetlands on the Site. Storm water drainage patterns are generally consistent with the surrounding topography and primarily flow to the west.

1.2 Proposed Redevelopment Plan

The proposed development consists of an eight-story structure with a cellar. The cellar will contain car parking, mechanical spaces, and building storage. The first floor (street level) will contain commercial retail space, a residential lobby, five residential units, a residential recreational area, laundry and bike rooms, offices, and additional mechanical and building storage rooms. Residential units will occupy the second through eighth floors, with an exterior residential recreation courtyard proposed on the second floor. The planned building construction will occupy nearly the entire Site leaving approximately 0.02 acres of landscaped area in the eastern-most portion of the Site.

1.3 Description Of Surrounding Property

The Site is irregularly shaped and is bounded on the north by Jefferson Avenue, on the northeast by Broadway and the elevated Metropolitan Transit Authority (MTA) railroad tracks, beyond which lie commercial properties; on the south by Hancock Street, beyond which lie a medical center and residential properties; and to the west by the Saratoga Avenue beyond which lie residential properties. There is also a two-story building bordering the southwest portion of the Site. Sensitive receptors such as daycare facilities, elder care facilities or hospitals were not identified in the properties immediately adjacent to the Site. The nearest sensitive receptors identified include two (2) childcare facilities located approximately 950 feet northeast and 1,900 southwest of the Site. A list of surrounding properties is presented on Table 1 below:

Table 1.1: Surrounding Properties

Direction	Adjacent Property
North	Jefferson Avenue and transit system sub-station
South	Healing Sanctuary Church and Hancock Street, followed by the Saratoga Community Center and Broadway Medical Center and residences
Northeast	Broadway and elevated MTA railroad (J and Z lines) tracks, followed by commercial uses
West	Saratoga Avenue, followed by residences

2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS

The Site was investigated in accordance with the scope of work presented in the NYSDEC-approved RIWP, which was approved by the NYSDEC on February 28, 2019. The investigation was conducted during May and June 2019, as well as, supplement groundwater investigation conducted in February 2020. The RIR is submitted to NYSDEC and New York State Department of Health (NYSDOH) in May 2020 and approved on July 16, 2020.

2.1 Previous Investigations

In addition to the RIR, the following environmental reports are attached to the RIR:

- Phase I Environmental Site Assessment, MWBE Site C, 7 Saratoga Avenue and 1510 – 1524 Broadway by AKRF, March 2017.
- Remedial Investigation Report, 7 Saratoga Avenue and 1510 – 1524 Broadway by AKRF, May 2018.
- Geotechnical Engineering Report, MWBE Site C, 1510 – 1524 Broadway by SESI, August 2017 (Supplemental Data added May 2018).

The following RECs were identified in the Phase I ESA Report prepared by AKRF and SESI's review of the Site history:

- **REC 1: Former Dry Cleaner and Other Former Manufacturing Operations** - Historical Sanborn maps and City Directories identified the following: a dry cleaner at 7 Saratoga Avenue from approximately 1949 to 1965; unspecified manufacturing at 1510 Broadway in 1962; a cleaning and dyeing facility at 1520 Broadway in 1928; a dress house/dress manufacturer at 1520 Broadway in 1934; a printer at 1516 Broadway in 1934; and watch and jewelry repair at 1510 Broadway in 1949.
- **REC 2: Demolition Debris and Historic Fill** – According to the AKRF Phase 1 ESA, electronic Department of Buildings (DOB) records included an oil burner application for 1512 Broadway and noted that construction debris may be present below the surface. A geophysical investigation conducted by AKRF did not identify anomalies indicative of an underground storage tank.
- **REC 3: Off-Site Impacts** – Historic industrial, automotive, and dry cleaning operations were noted in the surrounding area which included: garages with gasoline tanks south/west-adjacent to the property; auto repair was shown with one of the garages 75 feet south of the property and approximately 195 feet southwest of the property; a potential auto repair facility

was identified in the City Directories on the east-adjacent block; NYC Transit System substations were identified on the south and northwest adjacent blocks; a chemical and bleach bottling facility was noted approximately 250 feet northwest of the property; a paint manufacturer northwest of the property; and a dry cleaner was shown on Broadway, approximately 250 feet south-southwest of the property.

The locations of the above RECs are presented on **Figure 2.1**.

2.2 Summary of Remedial Investigations Results

For purposes of evaluating the remedial alternatives associated with the proposed Site redevelopment, the analytical results of the soil samples were compared to the NYSDEC USCOs and RRSCOs. The constituent concentrations in groundwater were compared to the applicable AWQS.

2.2.1 Soil/Fill Contamination

RI field investigation activities were completed between May and June 2019. Sixteen (16) soil borings (SB-14 through SB-16, SB-19 through SB-23, and SB-29 through SB-36) were advanced utilizing direct-push and hollow stem augur drilling techniques and eleven (11) test pits (TP-1 through TP-11) were advanced utilizing a backhoe. A total of seventy-three (73) soil samples were collected utilizing macro-core or split-spoon samplers and open excavation sampling. The soil boring locations are shown on **Figure 2.2A** and test pit locations are shown on **Figure 2.2B**. Soil samples were collected from each boring at depth intervals which appeared to be most contaminated based on visual observations, photoionization detector (PID) readings and olfactory observations. Soil samples were analyzed for full suite TCL/TAL + 30, 1,4-dioxane and PFAS. This soil sampling program was implemented to determine if a Track 1 unrestricted use remedy can be achieved. Sampling locations and concentrations of the SCO exceedances are identified in **Figure 2.2A** and **Figure 2.2B**. Analytical data is presented in **Tables 1A through 1F**.

PAHs including benzo[a]anthracene, benzo(a)pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz(a,h)anthracene, and ideno(1,2,3-cd)pyrene were identified in twenty-eight (28) soil samples from fourteen (14) soil borings/test pit locations from depths of 2.5 to 17 ft-bgs at concentrations that exceeded the USCO and RRSCO. These boring logs indicated the presence of historic fill which containing concrete, ash asphalt and brick up to 21 ft-bgs. The soil samples with PAHs exceeding the USCOs and RRSCOs are presented on

Figures 2A and 2B and Table 2.1 below. All SVOC results compared to the USCOs and RRSCOs are presented on Table 1B.

Table 2.1: Summary of PAHs Exceeding the NYSDEC USCO and RRSCO

Analyte	Part 375 6.8(a) USCO	Part 375 6.8(b) RRSCO	SB-14 3.5'	SB-14 8.5'	SB-15 2.5'	SB-15 9.5'	SB-15 13.0'	SB-16 4.5'	SB-16 10.0'	SB-16 16.5'	SB-20 5.0'	SB-20 7.0'	SB-22 4.0'	SB-23 4.5'	SB-23 7.0'	SB-29 15.0'
Sample Depth (ft)			3.5'	8.5'	2.5'	9.5'	13'	4.5'	10'	16.5'	5'	7'	4'	4.5'	7'	15'
SVOC (m g/kg)																
Benzo[a]anthracene	1	1	1.4	1.3	7.2	3	3.8	3.1	1.7	1.6	28	2.6	3.8	1.1	3.9	1
Benzo[a]pyrene	1	1	1.3	0.93	6.3	2.7	3	2.6	1.4	1.3	23	2.2	3.4	1.2	3.9	1.2
Benzo[b]fluoranthene	1	1	1.8	1.3	8.5	3.3	3.4	3.5	1.8	1.8	28	3.3	4.4	1.8	5.6	1.6
Benzo[k]fluoranthene	0.8	3.9	0.89	0.59	3.4	1.4	1.5	1.2	0.45	0.6	11	1	1.9	0.69	2.3	0.62
Chrysene	1	3.9	1.4	1.2	7.3	3.5	3.7	3.2	1.7	1.7	27	2.6	3.6	1.2	4.2	1
Dibenz(a,h)anthracene	0.33	0.33	0.24	0.16	1.1	0.53	0.55	0.48	0.25	0.24	4.3	0.44	0.64	0.24	0.69	0.23
Indeno[1,2,3-cd]pyrene	0.5	0.5	0.92	0.58	4.5	1.7	1.9	1.8	0.95	0.88	15	1.7	2.5	1	2.9	0.92
Analyte	Part 375 6.8(a) USCO	Part 375 6.8(b) RRSCO	SB-31 9.5'	SB-31 17.0'	SB-32 4.5'	SB-32 7.5'	SB-32 15.0'	SB-35 5.0'	SB-35 8.5'	SB-36 13.5'	TP-5 10.0'	TP-6 5.0'	TP-6 9.5'	TP-7 5.0'	TP-7 8.5'	TP-7 10.5'
Sample Depth (ft)			9.5'	17'	4.5'	7.5'	15'	5'	8.5'	13.5'	10'	5'	9.5'	5'	8.5'	10.5'
SVOC (m g/kg)																
Benzo[a]anthracene	1	1	36	7.9	1.7	5.5	0.11	0.43	5.1	2.9	2.5	25	1.4	3.3	6.6	5.7
Benzo[a]pyrene	1	1	28	7.1	1.5	5.2	0.26	0.54	4.5	2.5	2.3	22	1.4	2.9	6	4.3
Benzo[b]fluoranthene	1	1	34	9.8	2.3	7.1	0.22	0.7	6.4	3.5	3.3	29	2.1	4.4	7.8	6.5
Benzo[k]fluoranthene	0.8	3.9		2.9	1	2.3	0.078	0.26	1.9	1.4	1	11	0.78	1.8	3.1	2.1
Chrysene	1	3.9	36	8.4	1.7	5.3	0.096	0.44	5.1	2.8	2.6	25	1.5	3.2	6.5	5.9
Dibenz(a,h)anthracene	0.33	0.33	1.3	0.68	0.26	0.76	0.17	0.15	0.93	0.44	0.34	2.7	0.21	0.41	0.52	0.68
Indeno[1,2,3-cd]pyrene	0.5	0.5	15	3.4	0.97	3.7	0.99	0.62	3.2	1.7	1.4	14	0.75	1.5	3.2	1.9

Notes:

Bold = Compound Detected

Indicates compound Exceeds NYSDEC USCO

Indicates compound Exceeds NYSDEC RRSCO

Metals including arsenic, barium, cadmium, copper, lead, mercury, nickel, and zinc were identified in forty-three (43) soil samples from eighteen (18) soil borings/test pits at concentrations exceeding their USCO and/or RRSCO. The depth of metals impacts ranged from 1.5 to 19.5 ft-bgs across the Site exceeding their respective USCOs and RRSCO. The soil samples with metals exceeding the USCOs and RRSCOs are presented on Figures 2A and 2B and Table 2.2 below. All metals results compared to the USCOs and RRSCOs are presented on Table 1E.

Table 2.2: Summary of Metals Exceeding the NYSDEC USCO and RRSCO

Analyte	Part 375-6.8(a) USCO	Part 375-6.8(b) RRSCO	SB-14 3.5'	SB-15 2.5'	SB-15 9.5'	SB-15 13'	SB-16 12'	SB-16 16.5'	SB-19 2.5'	SB-19 14'	SB-20 5'	SB-20 7'	SB-20 11'
Sample Depth (ft)			3.5'	2.5'	9.5'	13'	12'	16.5'	2.5'	14'	5'	7'	11'
METALS (mg/kg)													
Arsenic	13	16	3.2	3.5	3.9	4.6	2.9 J	6.8	4.6	2.8 J	4.2	13.2	3.4
Barium	350	400	104	116	184	131	94.7	225	268	69.6	1630	2540	374
Copper	50	270	32.4	32.2	28.7	50.7	18.5	45.9	35	42.5	27.2	63.1	14.6
Lead	63	400	147	210	68.3	180	155	290	129	5.8	655	2380	185
Mercury	0.18	0.81	0.18	0.81	0.25	2	0.011 U	0.043	0.14	0.011 U	0.56	8.2	0.13
Nickel	30	310	23.4	11.3	17.5	90	15	17.1	26.7	77.3	13.5	26.3	14.7
Zinc	109	NA	191	174	103	216	94.8	227	198	41.1	779	2570	193
Analyte	Part 375-6.8(a) USCO	Part 375-6.8(b) RRSCO	SB-20 16.5'	SB-21 1.5'	SB-22 4'	SB-23 (4-4.5) 7'	SB-23 13'	SB-23 13'	SB-29 3.5'	SB-29 7.5'	SB-29 15'	SB-30 2.5'	SB-30 9'
Sample Depth (ft)			16.5'	1.5'	4'	4-4.5'	7'	13'	3.5'	7.5'	15'	2.5'	9'
METALS (mg/kg)													
Arsenic	13	16	3.4	3.3	3.5 J	9.1	4.8	1.7 J	4.5	2.4 J	15.5	3.9	3.4
Barium	350	400	214	166	336	479 F1	109	29.2 J	188	80.5	285	548	208
Cadmium	2.5	4.3	0.13 U	0.21 J	0.77 J	0.54 J	4.2	0.11 U	0.82	0.11 U	0.37 J	0.72	0.24 J
Copper	50	270	13.8	28.7	37.7	41.9 F1	176	15.8	53.7	13.8	41.9	36	22.2
Lead	63	400	72.6	221	568	701	5170	52.6	240	52.5	488	1500	872
Mercury	0.18	0.81	0.0098 U	0.067	0.16	0.010 U	0.2	1.7	0.011 U	0.72	0.043	0.010 U	0.12
Nickel	30	310	13.3	25.3	13.9	22.3	36.8	19.2	15.1	12.1	21.5	22.6	17.8
Zinc	109	NA	94.4	155	371	344	4310	64.6	297	41.4	205	234	139
Analyte	Part 375-6.8(a) USCO	Part 375-6.8(b) RRSCO	SB-30 17'	SB-31 1.5'	SB-31 9.5'	SB-31 11.5'	SB-31 17'	SB-32 4.5'	SB-32 7.5'	SB-34 2.0'	SB-34 9.5'	SB-35 5.0'	SB-35 19.5'
Sample Depth (ft)			17'	1.5'	9.5'	11.5'	17'	4.5'	7.5'	2'	9.5'	5'	19.5'
METALS (mg/kg)													
Barium	350	400	38.3	82.3	892	124	524	201	165	345	26.5 J	203	23.6 J
Cadmium	2.5	4.3	0.11 U	0.14 J	1.6	0.64 J	11.6	0.73 J	0.51 J	0.9	0.11 U	0.29 J	0.10 U
Copper	50	270	8.2	23.3	38200	184	82.2	66.9	42.9	38.3	10.6	32.4	10.8
Lead	63	400	27	79.3	3490	123	20800	456	186	307	13.1	511	4.9
Mercury	0.18	0.81	0.25	0.039	0.12	0.79	0.039	0.38	0.23	0.010 U	1.4	0.035	0.38
Zinc	109	NA	29.4	72	2020	236	2980	281	209	345	29.5	203	16.6
Analyte	Part 375-6.8(a) USCO	Part 375-6.8(b) RRSCO	SB-36 2.5'	SB-36 6.5'	SB-36 13.5'	TP-5 5.0'	TP-5 10.0'	TP-6 5.0'	TP-6 9.5'	TP-7 5.0'	TP-7 8.5'	TP-7 10.5'	
Sample Depth (ft)			2.5'	6.5'	13.5'	5'	10'	5'	9.5'	5'	8.5'	10.5'	
METALS (mg/kg)													
Barium	350	400	64.2	198	112	143	757	605	347	74.3	394	689	
Copper	50	270	21.7	26.2	32.2	31.1	32.6	29.9	56.9	22.4	36.2	38.5	
Lead	63	400	45.9	255	339	156	891	1020	486	79.3	685	723	
Mercury	0.18	0.81	0.0094 J	0.22	0.15	0.52	0.42	0.48	0.93	0.18	0.37	0.44	
Nickel	30	310	20.1	15.5	14.9	15.7	12.8	8.5	19.9	12.9	30.4	12.6	
Zinc	109	NA	171	141	106	153	483	822	436	71.9	614	425	

Notes:
 Bold = Compound Detected
 U = Compounds Not Detected
 J = Estimated Concentration
 Indicates compound Exceeds NYSDEC USCO
 Indicates compound Exceeds NYSDEC RRSCO

The pesticides including 4,4-DDD, 4,4-DDE, 4,4-DDT, and dieldrin were detected in forty-two (42) soil samples collected from eighteen (18) soil borings/test pits at concentrations exceeding their USCO, but below its RRSCO. The depth of pesticide impacts ranges from 1.5 to 10 18.5 ft-bgs. Total PCBs were also detected in three (3) soil samples collected from three (3) boring/test pits at concentrations exceeding its USCO, but below the RRSCO. The depth of PCB impacts ranged from 1.5 to 12 ft-bgs. The soil samples with pesticide exceeding the USCOs are presented on **Figures 2A and 2B** and the **Table 2.3** below. All pesticide results compared to the USCOs are presented on **Table 1C**.

Table 2.3: Summary of Pesticides Exceeding the NYSDEC USCOs

Analyte	Part 375-6.8(a) USCO	Part 375-6.8(b) RRSCO	SB-14 3.5'	SB-14 8.5'	SB-15 2.5'	SB-15 13.0'	SB-16 12.0'	SB-16 16.5'	SB-19 17.5'	SB-20 5.0'	SB-20 7.0'	SB-20 11.0'	SB-20 16.5'
Sample Depth (ft)			3.5'	8.5'	2.5'	13'	12'	16.5'	17.5'	5'	7'	11'	16.5'
PESTICIDES (mg/kg)													
4,4'-DDD	0.0033	13	0.25	0.069	0.0013 U	0.0014 U	0.0013 U	0.0015 U	0.0013 U	0.027	0.012	0.0012 U	0.0012 U
4,4'-DDE	0.0033	8.9	0.16	0.0012 U	0.003 Jp	0.006 Jp	0.014 p	0.0084 Jp	0.00093 U	0.0064 Jp	0.052	0.0048 Jp	0.00081 U
4,4'-DDT	0.0033	7.9	0.96	0.35	0.015	0.029	0.061	0.039	0.0061 J	0.035	0.28	0.027	0.014
Dieldrin	0.005	0.2	0.074	0.029	0.001 U	0.0044	0.001 U	0.0011 U	0.001 U	0.00096 U	0.043	0.0031	0.0052
PCBS (mg/kg)													
Total PCBs	0.1	1	0.011 U	0.014 U	0.011 U	0.012 U	0.28	0.096	0.011 U	0.075	0.012 U	0.0098 U	0.0095 U
Analyte	Part 375-6.8(a) USCO	Part 375-6.8(b) RRSCO	SB-21 1.5'	SB-22 4.0'	SB-23 4.5'	SB-23 7.0'	SB-29 3.5'	SB-29 7.5'	SB-29 15'	SB-30 2.5'	SB-30 9.0'	SB-30 17.0'	SB-30 13.5'
Sample Depth (ft)			1.5'	4'	4.5'	7'	3.5'	7.5'	15'	2.5'	9'	17'	13.5'
PESTICIDES (mg/kg)													
4,4'-DDD	0.0033	13	0.0014 U	0.0079 J	0.017	0.042 *	0.0093	0.0013 U	0.0013 U	0.0026 Jp	0.0013 U	0.0012 U	0.0012 U
4,4'-DDE	0.0033	8.9	0.00094 U	0.023 p	0.021	0.18	0.00092 U	0.0009 U	0.00088 U	0.00092 U	0.00092 U	0.00085 U	0.00083 U
4,4'-DDT	0.0033	7.9	0.0015 U	0.12	0.04	0.71	0.048	0.0079	0.023	0.029 p	0.021	0.007 J	0.0049 J
Dieldrin	0.005	0.2	0.001 U	0.015	0.0044	0.06	0.0065	0.00099 U	0.0036	0.0025 p	0.0028	0.00093 U	0.00092 U
PCBS													
Total PCBs	0.1	1	0.5	0.011 U	0.0093 U	0.012 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.0098 U	0.0097 U
Analyte	Part 375-6.8(a) USCO	Part 375-6.8(b) RRSCO	SB-31 1.5'	SB-31 9.5'	SB-31 17.0'	SB-32 4.5'	SB-32 7.5'	SB-32 15.0'	SB-32 18.5'	SB-34 2.0'	SB-34 9.5'	SB-35 5.0'	SB-36 2.5'
Sample Depth (ft)			1.5'	9.5'	17'	4.5'	7.5'	15'	18.5'	2'	9.5'	5'	2.5'
PESTICIDES (mg/kg)													
4,4'-DDD	0.0033	13	0.0041 J	0.054	0.012 Jp	0.0047 J	0.0095	0.0012	0.0012	0.0031	0.0012 U	0.0013 U	0.056
4,4'-DDE	0.0033	8.9	0.00087 U	0.00097 U	0.0018 U*	0.001 U	0.0009 U	0.00086	0.00085	0.0021	0.0054 J	0.0086 p	0.2
4,4'-DDT	0.0033	7.9	0.0014 U	0.28 p	0.55	0.033	0.046	0.0045	0.0039	0.009	0.0067 J	0.034	0.45
Dieldrin	0.005	0.2	0.0081	0.045	0.033	0.0025 p	0.00099	0.00095	0.00093	0.00098 U	0.0009 U	0.0047	0.0053 U
PCBS													
Total PCBs	0.1	1	0.01 U	0.011 U	0.011 U	0.012 U	0.01	0.01	0.0099	0.01 U	0.0095 U	0.011 U	0.011 U
Analyte	Part 375-6.8(a) USCO	Part 375-6.8(b) RRSCO	SB-36 6.5'	SB-36 13.5'	TP-5 5.0'	TP-5 10.0'	TP-5 12.5'	TP-6 5.0'	TP-6 9.5'	TP-7 5.0'	TP-7 8.5'	TP-7 10.5'	
Sample Depth (ft)			6.5'	13.5'	5'	10'	12.5'	5'	9.5'	5'	8.5'	10.5'	
PESTICIDES (mg/kg)													
4,4'-DDD	0.0033	13	0.0049 J	0.0012 U	0.0013 U	0.031	0.0084	0.015	0.0013 U	0.0013 u	0.037	0.015	
4,4'-DDE	0.0033	8.9	0.019	0.00085 U	0.0024 Jp	0.044 p	0.011	0.063 p	0.037 p	0.018 p	0.06 p	0.021 p	
4,4'-DDT	0.0033	7.9	0.044	0.011	0.0098	0.37	0.063	0.19	0.11	0.08	0.22	0.09	
Dieldrin	0.005	0.2	0.001 U	0.00094 U	0.00098 U	0.093	0.00094 U	0.00088 U	0.015	0.0072	0.021	0.011	
PCBS (mg/kg)													
Total PCBs	0.1	1	0.011 U	0.0099 U	0.01 U	0.077	0.01 U	0.15	0.011 U	0.01 U	0.11	0.012 U	

Notes:

Bold = Compound Detected

J = Estimated Concentration

U = Compound Not Detected

p : The %RPD between the primary and confirmation column/detector is >40%. The lower value has been reported.

* : LCS or LCSD is outside acceptance limits.

Indicates compound Exceeds NYSDEC URSCO

No exceedances of VOCs above any of the SCOs were detected in any of the soil samples collected during the RI. The analytical data compared to the USCOs and RRSCOs is presented on **Table 1A**.

The following conclusions can be made based on the above soil results:

- Soil exceedances of the USCO ranged in depth from 1.5 to 19.5 ft-bgs. The exceedances are a result of the historic fill encountered on the Site and the historic Site activities.
- PAHs were detected at concentrations which exceeded the USCO and RRSCO across the Site in soil samples collected from depths of 2.5 to 17 ft-bgs.
- Pesticides at concentrations exceeding the USCO were detected in soils from 1.5 to 18.5 ft-bgs.
- Three (3) locations exhibited total PCB concentrations in excess of the USCO were detected in soil exceeding the USCO at depths ranging from 1.5 to 12 ft-bgs.
- Metals were detected at concentrations which exceeded the USCO and RRSCO across the Site in soil samples collected from depths of 1.5 to 19.5 ft-bgs.

2.2.2 Groundwater Contamination

A total of nine (9) permanent groundwater wells (MW-1S, MW-1D, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7, and MW-11) were sampled for TCL VOCs, SVOCs, PCBs, pesticides, and metals. In addition, monitoring wells MW-1D, MW-2, MW-5 and MW-6 were sampled for 1,4-dioxane and PFAS. Supplemental monitoring wells MW-8, MW-9 and MW-10 were sampled for TCL-VOCs. A groundwater contour map was developed using well gauging and surveying data (**Figure 2.3**). The map depicts groundwater flow toward the southwest across the site, consistent with the Site topography. Monitoring well locations and results are included on **Figure 2.4**. Analytical data is presented in **Tables 2A through 2F**.

The June 2019 RIR groundwater results identified dissolved VOCs detected in groundwater at concentrations that exceed the NYSDEC AWQS and included 1,2-Dibromoethane (MW-1S at

0.22 ug/L and MW-7 at 0.2 ug/L), Chloroform (MW-5 at 26 ug/L, MW-7 at 12 ug/L and MW-11 at 36 ug/L), and PCE detected in 9 of 12 wells (ranging between 13 to 60 ug/L) as presented on **Table 2.4** below.

To establish a PCE migration pathway between a suspected off-site source and the site, monitoring wells MW-8, MW-9 and MW-10, which were installed in February 2020, were sampled on February 25, 2020. PCE was detected at concentrations that exceed the NYSDEC AWQS in all three wells. Chloroform exceeded the NYSDEC AWQS in monitoring well MW-10. The results are presented on **Table 2.4** below.

Table 2.4: Summary of VOC Exceeding the NYSDEC AWQS

Sample ID	NY SDEC AWQS	MW-1S	MW-1D	DUP (MW-1D)	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-11
VOC (ug/L)											
1,2-Dibromoethane	0.0006	0.22 J	0.001 U	NA	0.001 U	0.5 J	0.5 U	0.5 U	0.001 U	0.2 J	0.2 U
Chloroform	7	0.96 J	1.6	1	0.9 J	0.59 J	3.8	26	3.5	12	36
Styrene	5	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	21	0.42 U
Tetrachloroethene	5	22	34	25	19	13	26	2.9	33	0.38 U	0.67 J

Sample ID	NYSDEC AWQS	MW-8	MW-9	MW-10	DUP (MW-10)
VOC (ug/L)					
Chloroform	7	1.1	2.9	20	22
Tetrachloroethene	5	37	23	60	67

Notes:
 Bold = Compound Detected
 U = Compounds Not Detected
 J = Estimated Concentration
 Indicates compound Exceeds NYSDEC Groundwater Quality Criteria

The metals iron, magnesium, and manganese were detected at levels that exceeded their AWQS in one or more monitoring wells including MW-1D, MW-2, MW-3 MW-5 and MW-6 for total metals analysis as presented on **Table 2.5** below.

Table 2.5: Summary of Metals Exceeding the NYSDEC AWQS

Sample ID	NY SDEC AWQS	MW-1S	MW-1D	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7
TOTAL METALS (ug/L)									
Iron	300	408	392	2640	1380	528	3510	1660	1260
Manganese	300	13.1	528	921	1340	40.5	915	1160	322
Sodium	20000	131000	74100	185000	62800	137000	22400	45300	169000

Notes:
 Bold = Compound Detected
 Indicates compound Exceeds NYSDEC Groundwater Quality Criteria

The following conclusions can be made based on the above groundwater results:

- The groundwater depth is approximately 34 to 36 feet bgs and flows to the southwest based on groundwater data collected at the site during the June 2019 RI. Subsurface soil at the site consists of historic fill material from the surface to depth of 5 to 21 feet bgs. The fill is underlain by native sand with various amounts of silt and gravel and extends to a depth of approximately 100 feet bgs.
- In June 2019, PCE was identified in wells MW-1S, MW-2, MW-3, MW-4 and MW-6 at comparable levels in excess of the AWQS of 5 ug/L across the Site ranging from 13 to 34 ug/L. These wells are screened in the same water bearing zone between 35-50 ft-bgs.
- On February 25, 2020, PCE was detected in the off-site upgradient well (MW-10) at a concentrations that are higher than but within the same order of magnitude of concentration in the wells located on Site or at the downgradient site border (MW-8 and MW-9). The reported concentration in MW-10 were within order of magnitude of the downgradient wells.
- Supplemental sampling identified a decreasing gradient of PCE concentrations from the upgradient well (MW-10) to the downgradient off-Site wells MW-8 and MW-9. An off-site source may be contributing to on-site contamination, but no potential off-site sources have been identified.
- Since PCE and TCE were detected in soil samples below the USCO, no specific source area of the CVOCs in soil was identified during this RI effort. However, the Site historic uses included the use of chlorinated solvents including PCE and therefore may have contributed to the chlorinated solvents detected in groundwater. Remaining impacts to groundwater will be addressed by the future soil remedial action.
- No SVOCs, pesticides or PCBs were detected in any of the groundwater samples.
- PFAS detections were noted in the results of all four (4) wells sampled (MW-1D, MW-2, MW-5, and MW-6). This selection of wells provided an accurate measure of PFAS concentrations across the site that was also cost effective and approved in the RIWP. The highest detection was identified in a sample collected from MW-2 where perfluorooctanoic acid was detected at 86.5 nanograms per liter (ng/L).
- The groundwater data including the upgradient results and the geological strata that include a water bearing sand layer that extends to at least 100 ft-bgs, make the

identification of a source practically extremely difficult. Any discharge of PCE, which is denser than water, will sink through the sandy aquifer. This may result in a source and possibly several sources that are deep in the aquifer made of droplets of PCE along the sand column. This type of source is impractical to locate and may act as a constant source of PCE in the groundwater.

2.2.3 Soil Vapor Contamination

On May 8, 2019, SESI installed twelve (12) soil vapor (SV) sample points (SV-13, SV-14, SV-16 through SV-25) across the Site in the footprint of the proposed development. The SV samples were collected a depth of 15 ft-bgs. **Figure 2.5** presents the SV sampling locations and concentrations. The analytical data is summarized on **Table 3**.

The highest VOC concentration was identified as TCE which was detected in SV-19 (400 ug/m³) located on the southwestern portion of the Site. PCE was detected at concentrations above the method detection limit (mdl) in four (4) samples (SV-13, SV-16, SV-21, SV-23). Additional chlorinated compounds and petroleum related compounds were detected in soil gas samples across the Site: 1,3-butadiene (120 ug/m³), acetone (4,700 ug/m³), benzene (24 ug/m³), carbon disulfide (31 ug/m³), chloroform (29 ug/m³), chloromethane (21 ug/m³), cyclohexane (14 ug/m³), methyl ethyl ketone (340 ug/m³), n-heptane (76 ug/m³), n-hexane (120 ug/m³), tetrachloroethene (39 ug/m³), toluene (52 ug/m³), and trichlorofluoromethane (50 ug/m³). The ambient results were all non-detect. The analytical data for all soil vapor detections is presented on **Table 2.6** below.

Table 2.6: Summary of Soil Vapor Analytical Detections

Sample ID	SV-13	SV-14	SV-16	SV-17	SV-18	SV-19	SV-21	SV-22	SV-23	SV-24	SV-25	AMBIENT
VOC (ug/m³)												
1,3-Butadiene	8	6	6	8	120	35	20	12	ND	37	16	ND
Acetone	1300	490	1100	700	850	1500	990	790	4700	540	1500	ND
Benzene	ND	ND	ND	ND	ND	8	12	7	ND	24	10	ND
Carbon disulfide	ND	ND	ND	ND	ND	19	ND	ND	ND	16	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	29	ND	ND	ND	ND	ND
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Cyclohexane	ND	ND	ND	ND	11	ND	ND	ND	ND	9	ND	ND
Methyl Ethyl Ketone	110	47	54	ND	32	70	51	28	340	65	110	ND
n-Heptane	10	ND	ND	10	11	76	9	12	ND	49	17	ND
n-Hexane	9	ND	40	19	38	120	16	18	17	83	28	ND
Tetrachloroethene	34	ND	20	ND	14	ND	15	ND	39	ND	14	ND
Toluene	ND	ND	ND	8	8	52	10	ND	ND	13	9	ND
Trichloroethene	ND	ND	ND	ND	ND	400	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND	13	ND	ND	50	ND	ND	ND	ND	25	ND

Notes:

ND = Non-Detect

Bold = Compound Detected

2.3 Geological Conditions

Regional surface topography slopes slightly down to the west. Based on the U.S. Geological Survey – Brooklyn, New York 2013 Quadrangle map, the Site is at an approximate elevation of 40, relative to the NAVD88.

SESI conducted several geotechnical investigations at the Site for the proposed development from August 2017 to June 2019. During this time frame, a total of 11 geotechnical test pits and 15 geotechnical test borings were conducted.

The results of the geotechnical investigations are presented in the Geotechnical Investigation Reports prepared by SESI dated August 23, 2017 (Supplemental Data added May 9, 2018), and June 11, 2019. The geology of the Site consists of a layer of historic fill that is present throughout the Site, to depths of 5 to 21 ft-bgs. This historic fill consists of silty sand soil mixed with demolition materials including bricks, concrete, asphalt, steel strapping, old pipes, wood, and other miscellaneous materials. This uncontrolled fill may be the remains of former structures on the site which were demolished and covered with a layer of soil. The uncontrolled fill directly overlies natural glacial sands, which consist of brown coarse-fine sand, with a trace to a little silt and gravel. These native sand soils extend to a minimum depth of 100 ft-bgs, which is the deepest boring conducted during the geotechnical investigations.

The depth to groundwater was measured in the monitoring wells during the Phase II investigation to be 35.8 ft bgs in the southeastern portion of the Site to 36.5 ft bgs in the northwestern portion of the Site. The groundwater gradient was determined to be in a southwesterly direction across the Site.

2.4 Conceptual Site Model

The environmental and geotechnical investigations revealed that the Site is underlain with a layer of impacted historic fill. Contaminants include PAHs and metals (barium, cadmium, copper, lead, and mercury) which exceed both the USCOs and RRSCO across the Site. PAH impacts to soil exceeding the USCO were identified to depths up to 17 ft. bgs, and metal impacts to soil exceeding the USCOs were identified at depth of up to 19.5 ft bgs at several isolated locations of the Site. Contaminants identified in native soils beneath the historic fill are suspected to be natural background.

The applicable standards criteria and guidance (SCGs) for the Site groundwater are the NYSDEC AWQS (cf. Section 703.5). Metals (manganese, iron, sodium), as well as dissolved phase 1,2-dibromoethane, chloroform, styrene and PCE were detected at concentration exceeding the AWQS throughout the Site. Although a groundwater contaminant source was not identified within on-Site soil, concentrations of PCE suggest an off-Site source and possible on-site source because of the Site history.

Well gauging during the June 2019 RI and surveying data was used to determine groundwater at the site to flow in a southwesterly direction and elevation 12.5-12.7 ft above mean sea level (ft-amsl). This elevation corresponds to a depth of 35-36 ft bgs. The geotechnical investigation reported the water table at 38 ft bgs based on the boring logs. The depth to groundwater should be expected to vary seasonally and with wet weather.

The pathway of the contaminated groundwater to human receptors is usually limited to the ingestion of the groundwater or by direct exposure. However, due to the groundwater depth (greater than 35 ft. bgs) and because Brooklyn does not use groundwater for drinking water purposes, it is unlikely that a human or ecological exposure pathway exists.

Finally, the VOCs detected in soil and in soil vapor can result in soil vapor intrusion into the future on-Site buildings. Since these VOCs may result in soil vapor intrusion into the future on-Site buildings, vapor mitigation, such as the installation of a vapor barrier, may be needed for this Site.

2.5 Identification of Standards, Criteria and Guidance

The following standards and criteria typically will apply to Site Characterizations, Remedial Investigations, remedy selection, remedial actions 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 New York State Department of Environmental Conservation
- 6 NYCRR Part 257 - Air Quality Standards
- 29 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response
- TOGS 1.1.1 - Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations
- Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (October 1994)
- NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (Final October 2006)

- DER Interim Strategy for Groundwater Remediation at Contaminated Sites in New York State
- 6 NYCRR Part 375 - Regulations Subparts 1, 3 and 6 applicable to the Brownfield Cleanup Program
- Citizen Participation in New York's Hazardous Waste Site Remediation Program: A Guidebook (June 1998)
- USEPA Office of Solid Waste and Emergency Response Directive 9355.047FS Presumptive Remedies: Policy and Procedures (September 1993)
- USEPA Office of Solid Waste and Emergency Response Directive 9355.048FS Presumptive Remedies
- Site Characterization and Technology Selection for CERCLA sites with Volatile Organic Compounds in Soils (September 1993)
- 6 NYCRR Part 612 - Registration of Petroleum Storage Facilities (February 1992)
- 6 NYCRR Part 613 - Handling and Storage of Petroleum (February 1992)
- 6 NYCRR Part 614 - Standards for New and Substantially Modified Petroleum Storage Tanks (February 1992)
- 6 NYCRR Part 371 - Identification and Listing of Hazardous Wastes (November 1998)
- 6 NYCRR Subpart 374-2 - Standards for the Management of Used Oil (November 1998)
- 6 NYCRR 375 Table 375-6.8(a) and Table 375-6.8(b)
- 6 NYCRR Parts 700-706 - Water Quality Standards (June 1998)
- 40 CFR Part 280 - Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks
- STARS #1 - Petroleum-Contaminated Soil Guidance Policy
- STARS #2 - Biocell and Biopile Designs for Small-Scale Petroleum-Contaminated Soil Projects
- SPOTS #14 - Site Assessments at Bulk Storage Facilities (August 1994)
- Spill Response Guidance Manual
- Permanent Closure of Petroleum Storage Tanks (July 1988)
- NYSDOH Environmental Health Manual CSFP-530 - "Individual Water Supplies - Activated Carbon Treatment Systems"
- 40 CFR Part 144 - Underground Injection Control Program
- 10 NYCRR Part 67 – Lead

- 12 NYCRR Part 56 - Industrial Code Rule 56 (Asbestos)
- 6 NYCRR Part 175 - Special Licenses and Permits--Definitions and Uniform Procedures
- 6 NYCRR Part 371 - Identification and Listing of Hazardous Wastes (November 1998)
- 6 NYCRR Part 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities (November 1998)
- 6 NYCRR Subpart 374-1 - Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities (November 1998)
- 6 NYCRR Subpart 374-3 - Standards for Universal Waste (November 1998)
- 6 NYCRR Part 608 - Use and Protection of Waters
- TAGM 4013 - Emergency Hazardous Waste Drum Removal/ Surficial Cleanup Procedures (March 1996)
- TAGM 4059 - Making Changes to Selected Remedies (May 1998)
- Groundwater Effluent Limitations
- TOGS 1.3.8 - New Discharges to Publicly Owned Treatment Works
- TOGS 2.1.2 - Underground Injection/Recirculation (UIR) at Groundwater Remediation Sites
- OSWER Directive 9200.4-17 - Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (November 1997)
- Groundwater Monitoring Well Decommissioning Procedures (May 1995)
- The activity is a component of a program selected by a process complying with the public participation requirements of section 1.10, to the extent applicable.

2.6 Environmental And Public Health Assessments

2.6.1 Qualitative Human Health Exposure Assessment

This exposure assessment discusses potential migration routes by which chemicals in the environment may be able to reach human receptors in accordance with NYSDEC DER-10 sections 3.14(c)17, 3.3(c)4 and Appendix 3B. This discussion is based on current and hypothetical future site conditions at the investigation area.

An exposure assessment must evaluate five (5) elements that comprise an exposure pathway. A complete exposure pathway includes the following:

1. A description of the contaminant source. If the original source is unknown, then a

- description of the contaminated environmental medium at the point of exposure;
2. An explanation of the transport mechanism;
 3. An identification of all potential exposure points;
 4. A description of the exposure route at the contact point; and
 5. A receptor population.

During this investigation, contaminated soil, soil vapor and groundwater were identified; however, the sources of soil vapor and groundwater contamination remain undetermined.

Pesticides and PCBs were identified at concentrations in soil exceeding the NYSDEC USCO. Polycyclic aromatic hydrocarbons (PAHs), and metals were identified at concentrations in soil exceeding the USCO and RRSCO. PAHs and metals are present throughout the site within the historic fill.

The Site groundwater which was gauged at an approximate depth of 35 to 36 ft. bgs during the June 2019 RI, and has been impacted with dissolved VOCs, CVOCs (PCE) and metals at concentrations exceeding the NYSDEC Technical Operational Guidance Series (TOGS) 1.1.1 GA Ambient Water Quality Standards (AWQS).

The Site soil vapor has been impacted by VOCs including 1,3-butadiene, acetone, benzene, carbon disulfide, chloroform, chloromethane, cyclohexane, methyl ethyl ketone, n-heptane, n-hexane, tetrachloroethylene, toluene, trichloroethene, and trichlorofluoromethane.

The site is currently vacant and is covered hard surfaces e.g. the pre-existing building foundations and some paving. The surrounding properties consist of commercial properties. Sensitive receptors such as childcare facilities, elder care facilities and hospitals were not identified in the properties immediately adjacent to the Site. The nearest childcare facilities are located approximately 950 feet northeast and 1,900 southwest of the Site.

The proposed development consists of an eight-story structure with a cellar. The cellar will contain car parking, mechanical spaces, and building storage. The first floor (street level) will contain commercial retail space, a residential lobby, five residential units, a residential recreational area, laundry and bike rooms, offices, and additional mechanical and building storage rooms. The planned building construction will occupy nearly the entire Site leaving approximately 0.02 acres of landscaped area in the eastern-most portion of the Site.

Groundwater

Potential groundwater exposure points include ingestion, dermal contact and inhalation of vapors. Brooklyn utilizes municipal water (not groundwater) for drinking purposes. Thus, ingestion as a potential exposure point may be eliminated from further evaluation.

Potential exposures through dermal contact and vapor inhalation would arise during future demolitions, redevelopment or utility repairs where workers, visitors, or trespassers may be exposed to groundwater. However, since groundwater is usually found at approximately thirty-five (35) to thirty-six (36) feet bgs, it may reasonably be concluded that such a potential is very low. Further, groundwater remediation will aim to mitigate potential groundwater vapor concerns and reduce contamination to levels below the NYSDEC AWQS.

Surface Water

Surface water is not present on the Site. Thus, this exposure pathway may be eliminated from further evaluation.

Soils

Potential routes of exposure to subsurface and surface soils include dermal contact, ingestion and inhalation of soil particulates. At present, potential exposure points have been eliminated by restricting public access to the Site through fencing. During future construction activities, specifically disturbance of soils, the potential for exposures to soils would increase for on-site workers, utility workers, visitors and trespassers.

Contaminant exceedances of the NYSDEC RRSCO in the Site soil associated with contaminated historic fill from 5 to approximately 21 feet below grade were identified as a risk to human health. The potential exposure pathways to humans can be through direct dermal contact, incidental ingestion or dust inhalation of the contaminated soils. Measures planned to eliminate these potential pathways include: the planned soil source removal action, worker use of personal protective equipment, and dust monitoring. All are detailed in the RAWP.

At the completion of the project, exposure through dermal contact and ingestion will be further reduced by the installation of asphalt, concrete slab and landscaped areas of the planned redevelopment.

Soil Vapor

When volatile organics are detected in soil gas, it creates a potential exposure to building occupants through vapors accumulating beneath structures or impacting indoor air quality within

a structure. Currently, all potential human receptors are restricted from entering by fencing. Thus, a potential exposure point does not exist. However, after the site is redeveloped, a potential that vapors could accumulate in enclosed areas such as basements, crawl spaces, etc. of the proposed building would arise.

TCE concentrations were detected in the Site soil vapors. The exposure route for soil vapor is through the inhalation of the contaminated soil vapor which could intrude into the enclosed spaces of below grade structures. Therefore, soil vapor mitigation may be part of the remedy to address this exposure pathway. Additionally, removal of the historic fill may mitigate off-site exposure routes.

The off-site exposure potential of Site contaminant sources include groundwater, soil vapor, and soil dust. Because groundwater is not used in Brooklyn for drinking water, a potential exposure pathway does not exist for this source. At present, soil vapor does not present a potential off-site exposure due to the undeveloped (open) condition of the Site. The future potential exposure of soil gas will be eliminated by engineering controls such as a vapor barrier. Off-site exposure to soil dust during excavation activities will be eliminated through dust monitoring and dust control measures. After the remediation activities, exposure to contaminated soil dust will be eliminated by the planned excavation and disposal of the contaminated soil, and the installation of asphalt, concrete slab and landscaped areas of the planned redevelopment.

The following summary table provides an overview of the current and potential exposures for the Site:

Environmental Media & Exposure Route	Human Exposure Assessment
Direct contact with surface soils	People are not coming into contact because public access to the site is restricted by fencing; trespassers may come into contact.
Inhalation of soil dust	Dust monitoring will be completed during excavation activities of contaminated soil.
Direct contact with soil dust	
Direct contact with subsurface soils	People can come into contact if they complete ground intrusive work.
Ingestion of groundwater	Groundwater is not used for drinking; Brooklyn is served by a public water supply.
Direct contact with groundwater	Potential exposure risk is low due to groundwater located at over 30 feet bgs.
Inhalation of air	Currently, the potential exposure risk is low due to undeveloped condition of the Site.
	Engineering controls such as a soil vapor barrier and SSDS will be installed during construction.
	A soil vapor intrusion evaluation will be completed after Site development.

2.6.2 Fish and Wildlife Impact Analysis

The Fish and Wildlife Resources Impact Analysis (FWRIA) Decision Key (NYSDEC, 2010; DER-10 Appendix 3D) was utilized to evaluate the site for potential fish and wildlife impacts. The result of the assessment determined that the Site does not contain any ecologically sensitive resources and hence the contaminated soils are not expected to have any impacts on any ecological resources.

2.7 Remedial Action Objectives

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

2.7.1 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

- Restore ground water aquifer, to the extent practicable, to pre-disposal/pre-release conditions.

2.7.2 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 or surface water contamination.

2.7.3 Soil Vapor RAOs

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from potential present and future soil vapor intrusion into buildings at the site.

3.0 DESCRIPTION OF REMEDIAL ACTION PLAN

3.1 Evaluation of Remedial Alternatives

The proposed remedial alternatives were evaluated using the remedial criteria set forth in 6 NYCRR Part 375-1.8(f) in conjunction with the guidance provided in Section 4.3 of DER-10.

Track 1

A remedy pursuant to this track must achieve compliance with the USCOs set forth in 6 NYCRR Table 375-6.8(a). Institutional and engineering controls are allowed only for periods of less than five years except in the limited instance where a volunteer has conducted remedial activities resulting in a bulk reduction in groundwater contamination to asymptotic levels. This alternative would involve the complete removal and/or remediation of the soil with exceedances to the USCO, which were encountered at up to 19.5 ft-bgs across the Site. A feasible remedial technology that may be used to implement this alternative involves the excavation of the contaminated soil and transportation to an approved off-site facility for disposal.

Temporary institutional and engineering controls may be implemented to address contamination in groundwater and soil vapor for a conditional Track 1 remedy. The groundwater remediation proposed will include the design and implementation of a permeable reactive barrier (PRB) installed upgradient and downgradient on the Site to prevent off-site and on-site migration of contaminated groundwater. The PRB will likely consist of injecting a nano or micro scale zero valent iron (ZVI) to create a vertical reactive barrier around the Site. The ZVI reduces the CVOC to chemicals that are either less toxic or degrade faster due to natural biodegradation such as ethene. The detailed design of the PRB, which will include the depth and thickness of the reactive barrier and quantity of ZVI to be injected, will be provided to NYSDEC and DOH for review and approval prior to implementation. Following remediation, monitored natural attenuation (MNA) that consists of periodic monitoring of the contaminant levels in the Site groundwater monitoring wells will constitute an engineering and institutional control until the groundwater levels are below the standards or until they reach asymptotic levels that are accepted by the NYSDEC. Given the low levels of groundwater exceedances, it is possible that the groundwater will meet the AWQS or stabilize at asymptotic levels within five years after the remedial actions. If groundwater levels do not reach AWQS or the asymptotic levels are not accepted by the DEC or DOH, then the remedy will be considered a Track 2 as described below.

A soil vapor barrier and passive sub-slab depressurization system (SSDS) will be installed as a temporary (up to 5 years) engineering control for the mitigation of any risks resulting from

the detected soil vapors on the Site. The vapor intrusion risk will continue to be monitored up to five years. The VI monitoring will include the collection of samples from the sub-slab of the proposed buildings and the indoor air in accordance with the NYSDOH "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" (October 2006) and the May 2017: Updates to Soil Vapor / Indoor Air Decision Matrices. If within the 5 years the soil vapor levels have dropped to below the "no further action" sub-slab vapor concentrations, then the SSDS will not be considered an EC anymore and the condition on the Track 1 remedy will be removed. The monitoring will be described in a Site Management Plan (SMP). The SSDS design will be provided for approval once the proposed building plans are completed. If soil vapors continue to exceed the matrix values that require mitigation or monitoring, then the SSDS will become a permanent EC and the remedy will be considered a Track 2 as described below.

Track 2

Cleanups pursuant to this track may consider the intended future use in determining the appropriate cleanup levels for soil. This track requires the Volunteer implement a cleanup that achieves an SCO from tables in 6 NYCRR 375-6.7(b) that is consistent with the intended Site use for the top 15 feet of soil (or bedrock if less than 15 feet. The Site remediation pursuant to Track 2 would involve excavation and disposal of the contaminated soils to meet the objective SCOs.

The way to meet Track 2 would be to perform complete excavation down to at least 15 feet since the fill material contained contaminants that exceeded the Track 2 SCOs down to this depth, but this would leave contamination known to exist down to 21 ft bgs. Institutional and engineering controls which limit Site use and on-Site groundwater use can be used without regard to duration.

The groundwater remediation would be as described under Tack 1 or MNA. If the active remedy is applied and groundwater concentrations do not meet the AWQS or reach levels accepted by the DEC within 5 years, then the MNA and wells will be considered a long term engineering control under this track.

If the soil vapor levels do not reach the "no action" level as described in the matrices (May 2017), then the SSDS will continue to act as an EC and the remedy will be Track 2.

A Track 2 cleanup at a restricted residential use site requires a Site Management Plan (SMP) to ensure that any institutional and engineering controls are maintained, and material removed from the Site (post remedial action) is managed properly.

Track 3

The Track 3 cleanup is not applicable to this site because the contaminants present on this Site are common and are listed in the SCOs in NYCRR 375-6.8(b) tables.

Track 4

A Track 4 remedy for a restricted residential use does not need to meet specific soil cleanup objectives but requires source removal and typically a Site-wide cover system where, as here, there is Site-wide surficial contamination.

Short and long-term institutional and engineering controls can achieve protection of public health and the environment. In the event a remedy under Track 4 were to be implemented for this Site, it must provide a cover system over exposed remaining soil contamination. Soils which are not otherwise covered by structures such as buildings, sidewalks or pavement must be covered with 18 inches of soil that complies with the unrestricted or restricted residential SCOs and clean unrestricted topsoil in the top 6 inches.

Track 4 also includes an SMP as an institutional control to ensure that any institutional and engineering controls are maintained, and material removed from the site (post remedial action) is managed properly. The SMP will include periodic (annual) monitoring and reporting of the cover system to ensure continued protection of the human health and the environment.

No Action Alternative

The no action alternative would leave existing sources of contamination in soil, groundwater, and soil vapor. The no action alternative is thus unacceptable and has not been compared to the factors below.

Protection of human health and the environment:

Although all tracks will provide adequate protection of human health and the environment, Track 1 would be more protective than the other cleanup tracks because it would remove all soil contamination, which also act as on-Site sources of groundwater contamination. This conditional Track 1 remedy requires short term ongoing institutional and engineering controls to manage the vapor contamination to effectively protect human health and the environment and remediate groundwater. A Track 1 remedy also initially costs more and is less implementable than Track 2 and 4 remedies. However, if Track 1 can be implemented through the complete removal of all the contaminated soil, and implementation of a PRB, then groundwater should be able to naturally attenuate more rapidly than from the other remedies. Moreover, because a Track 1 remedy requires no long term institutional or engineering controls, it is potentially less costly and more

implementable in the long run than remedies that rely on such controls for long-term effectiveness. A Track 4 remedy would also be protective of human health and the environment if the proper long-term engineering and institutional controls are put in place and managed in an SMP. However, groundwater would remain contaminated for a longer time.

Compliance with standards, criteria, and guidelines (SCGs):

All cleanup tracks will achieve applicable cleanup standards. However, a Track 1 cleanup achieves the most stringent set of State standards than a Track 2 or 4 cleanup.

Short-term effectiveness and impacts:

Generally, Track 1 provides the best short term effectiveness because it promptly removes the most contaminant mass from the Site. Track 2 also accomplishes this, but to a lesser extent. Track 4 is less effective in this regard. Tracks 1 and 2 are somewhat less favorable in terms of short-term impacts primarily because mass removal of the contaminated soils generates more truck trips than a Track 4 limited removal remedy. A Track 4 approach also reduces the risk of construction worker exposure by reducing the volume of contaminated soil being managed and has less potential to cause dust and traffic issues. Excavation may result in a greater potential for migration of impacts from the open excavation (e.g. wind erosion, storm water intrusion, etc.), however, an air monitoring program and erosion and sediment controls will be implemented to minimize and control any dust migration.

Long-term effectiveness and Performance:

Because Tracks 1 & 2 would involve removal of the greatest amount of contaminated soil, they will provide the most long-term effectiveness. As already discussed above a Track 1 cleanup will allow the Site to be used for any purpose without restriction and without reliance on the long-term employment of ICs or ECs (which can fail and require on-going monitoring and maintenance to remain effective over the long-term). A restricted residential Track 2 clean-up allows the Site to be used for almost all possible uses in an urban setting but has the same requirements for long-term ECs and ICs.

The long-term effectiveness of the Track 4 clean-up will be ensured with adherence to the SMP and recording of an Environmental Easement. Although contaminants remain at the Site, a properly maintained cover system is effective at eliminating the risk of dermal exposure.

Reduction of toxicity, mobility, or volume of contaminated material:

Tracks 1 through 4 will reduce of toxicity and mobility. A Track 1 or 2 would result in more reduction in the volume of contaminated soils than in a Track 4 clean-up. While Track 4 provides a relatively smaller reduction in volume than the other tracks, it relies primarily on the decrease of contaminant mobility.

Constructability:

Tracks 1, 2 and 4 are all implementable given the location and the planned use for the Site.

While there are short term potential impacts from a Track 1 or 2 remedy, the Site is located in the middle of an urban area, and, therefore disposal of the contaminated soils and truck access will not be a problem. Moreover, these short-term impacts will be avoided through implementation of the community air monitoring program (CAMP) and health and safety plan (HASP), which will employ truck washing and odor and dust control measures. Therefore, Track 1 or 2 are implementable remedies for this Site.

Cost effectiveness:

The preferred alternative should provide optimal suitability of the eight accompanying evaluation factors with minimal remedial cost. The contaminated soil/fill layer extends from the surface to a depth of 19.5± ft-bgs. Removal of the soil exceeding the USCO to achieve Track 1 or 2 Site wide will be costly. However, this mass removal results in long term savings by eliminating (or, in Track 2, significantly reducing) the need for indefinite cap monitoring and maintenance. Therefore, a Track 1 or 2 remedy for the Site is cost effective.

The implementation of a PRB for groundwater will be costly. However, it will enhance the removal of dissolved VOCs on the Site and prevent off-site migration. Some cost savings may be derived if the duration of MNA monitoring of groundwater is reduced. This is especially so in Track 1 or 2 if the mass of contaminants that could be a source of groundwater contamination is removed from the Site.

Community Acceptance:

A community outreach program will be incorporated into all remedial alternatives, per NYSDEC Brownfield Program law and regulations. The Site development will include residential housing and is part of an area wide redevelopment that includes a mix of modern residences and retail stores.

Land use:

All cleanup tracks would achieve remediation for the planned residential use of the Site, which is consistent with Brooklyn's proposed plans for the area. Developing the property will create short term construction impacts, but the creation of a new housing project will provide significant community benefits.

Zoning: All of the proposed remedies under each track will facilitate the Site to be utilized for a proposed mixed commercial-residential development, which is consistent with applicable zoning laws and anticipated future use of the site.

Applicable comprehensive community master plans or land use plans: Implementation of all Tracks (with institutional controls) cleanup will facilitate the proposed commercial-residential development, which is consistent with current local land use plan.

Surrounding property uses: Any cleanup approach is not expected to significantly impact land use of the surrounding properties as the truck traffic and access will be on public roads. There will be short term impacts from the remediation and construction project but these will result in long-term benefits of converting defunct, abandoned and contaminated property into new affordable housing and commercial uses.

Citizen Participation: Citizen Participation during implementation of a remedial program will proceed in accordance with the Citizen Participation Plan included as **Appendix A** of this RAWP and as noted above will have minimal community impact. Any short-term impacts will be addressed by the CAMP and HASP.

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

Land use designations: A Track 1 remedy will not restrict any current or future land use designations. A restricted residential Track 2 will have very minimal restrictions on the future land use of the property. A Track 2 will have restrictions that will be managed in the SMP.

Population growth patterns: Any of the proposed remedies will not impact reasonably anticipated population growth patterns in the area other than to better accommodate growth by providing for new housing.

Accessibility to existing infrastructure: Existing infrastructure is present in the surrounding area but the on-site infrastructure had to be demolished and removed as part of the building

demolitions and more infrastructure will be removed during the remedy. However, new infrastructure will be installed as part of remediation/redevelopment.

Proximity to natural resources: The closest surface water body, the East River, is located approximately 3 miles west of the Site. Storm water drainage patterns are generally consistent with the surrounding topography and primarily flow to the west towards.

Off-Site groundwater impacts: Off-Site groundwater impacts attributable to the Site were not identified during the RI activities. Measures to prevent any off-site groundwater impacts are proposed in this work plan.

Geography and geology of the Site: See **Section 2.3** above.

Current Institutional Controls: There are no current institutional controls associated with the Site. An institutional control may be required to address the long-term management of soil and possibly impacted groundwater remaining at the Site following remediation.

3.2 Selection of the Preferred Remedy

The remedial alternatives analysis determined that a conditional Track 1 (if achievable) or Track 2 remedy will be the goal for the Site.

3.3 Summary of Selected Remedial Actions

A summary of the selected Conditional Track 1 or Track 2 remedial actions to address the impacts identified are discussed below:

1. Installation of support of excavation (SOE) system consisting of sheeting and shoring along the side walls of the entire Site for structure stability of the excavation pit and to prevent impact to off-site structures. A sheet pile wall system will be installed to support the excavation of the on-site contaminated soil and contaminated historic fill.
2. Excavation and off-Site disposal of all on-Site soils which exceed unrestricted SCOs, as defined by 6 NYCRR Part 375-6.8. If endpoint confirmatory sampling does not confirm that Track 1 unrestricted use was achieved, then the remedy will achieve a Track 2 restricted residential cleanup.
3. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;

4. Collection and analysis of end-point samples to evaluate the performance of the remedy with respect to attainment of the Track-specific SCOs;
5. Documentation of all 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;
6. Import of backfill materials and reuse of soil excavated during redevelopment construction activities, to be used for backfill and cover must be in compliance with: (1) chemical limits and other specifications included in NYCRR 375-6.8 (b) and DER-10 (2) all Federal, State, local rules and regulations and site-specific approvals for handling/reuse and transport of material;
7. Zero-valent iron will be injected into the subsurface to form a vertical permeable reactive barrier (PRB) along the upgradient and downgradient boundaries of the Site to destroy contaminants entering or leaving the Site. If post-excavation monitoring of VOCs does not show achievement of groundwater remedial objectives within 5 years of the date of the Certification of Completion, then the remedy will achieve a Track 2 residential cleanup.
8. The installation of a vapor barrier and sub slab depressurization system (SSDS) as a vapor mitigation measure in the building foundation.
9. Monitoring of sub-slab vapors and indoor air in the enclosed areas of the proposed building for up to 5 years. If monitoring shows that the soil vapor remedial objectives have been achieved, no further mitigation will be required.
10. Recording of an Environmental Easement for the entire Site; [conditional Track 1 also needs an easement]
11. Preparation of a Site Management Plan, for either short-term (Track 1) or long-term (Track 2) management of remaining contamination as required by the Environmental Easement, particularly as they pertain to future phases of construction, including plans for: (1) Institutional and Engineering Controls, (2) monitoring, (3) soil excavation and (4) reporting;
12. 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 overseen and certified by the SESI Remedial Engineer of Record described below.

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

4.0 REMEDIAL ACTION PROGRAM

4.1 Governing Documents

4.1.1 Site Specific Health & Safety Plan (HASP)

A copy of the SESI HASP is included as **Appendix B**. All remedial work performed under this plan will be in full compliance with governmental requirements, including Site and worker safety requirements mandated by Federal OSHA.

The Volunteer and associated parties preparing the remedial documents submitted to the State and those performing the construction work, are completely responsible for the preparation of an appropriate HASP and for the appropriate performance of work according to that plan and applicable laws.

The HASP and requirements defined in this RAWP pertain to all remedial and invasive work performed at the Site until the issuance of a Certificate of Completion.

4.1.2 Quality Assurance Project Plan (QAPP)

A copy of SESI QAPP is included as **Appendix C**. All field sampling procedures and analytical methods will be implemented in accordance with this QAPP.

4.1.3 Soil/Materials Management Plan (SoMP)

The SoMP is included as 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.

4.1.4 Storm-Water Pollution Prevention Plan (SWPPP)

A SWPPP will be prepared prior to start of remediation or construction work. The SWPPP will address requirements of the New York State Storm-Water Management Regulations including physical methods to control and/or divert surface water flows and to limit the potential for erosion and migration of Site soils, via wind or water.

The erosion and sediment controls included in the SWPPP will be in conformance with requirements presented in the New York State Guidelines for Urban Erosion and Sediment Control and will be thoroughly analyzed during the SEQRA EIS process.

4.1.5 Community Air Monitoring Plan (CAMP)

A copy of the CAMP for the site is included as **Appendix D**.

4.2 General Remedial Construction Information

4.2.1 Project Organization

1510 Broadway LLC is the BCP Volunteer and redeveloper of the Site. SESI is the environmental consultant for 1510 Broadway LLC. A table summarizing the various personnel associated with the project is included as **Table 4.1** below.

Table 4.1: Project Personnel

Name	Company	Project Position	Address	Phone Number
Joseph Apicella	1510 Broadway LLC	Volunteer	438 Fifth Avenue, Suite 100, Pelham, NY 10803	(914) 667-7227
Fuad Dahan, PE	SESI Consulting Engineers, P.C.	Environmental Consultant's Project Manager	12A Maple Avenue Pine Brook, NJ 07058	(973) 808-9050
Fuad Dahan, PE	SESI Consulting Engineers, P.C.	Remedial Engineer	12A Maple Avenue Pine Brook, NJ 07058	(973) 808-9050
Lee Ronnie	NYSDEC	Project Manager	625 Broadway, Albany, NY 12233	(518) 402-9767

4.2.2 Remedial Engineer

The Remedial Engineer for this project will be Fuad Dahan, PE. 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 1510 Broadway Dry Cleaner Site (Site No. C224280). The Remedial Engineer will certify in the FER that the remedial activities were observed by qualified environmental professionals under his supervision and that the remediation requirements set forth in the RAWP 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 review all pre-remedial plans submitted by contractors for compliance with this RAWP and will certify compliance in the FER.

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

4.2.3 Remedial Action Schedule

A remedial action schedule is included as **Table 4.2** below. The schedule includes estimates of time required to complete the activities associated with the remedial action. It is based on elapsed time from receipt of NYSDEC approval. Once NYSDEC approves this RAWP, an updated schedule showing actual dates will be provided to the NYSDEC as an addendum to this plan.

TABLE 4.2: Remedial Action Schedule

Remedial Activity	Scheduled Date
Draft Remedial Action Work Plan (RAWP) Submit to NYSDEC	August 2020
Address NYSDEC Comments to RAWP and Resubmit	January 2021
45-day Public Comment Period for RAWP is Initiated	October 14, 2020
Public Comment Period for RAWP Ends & NYSDEC Approves RAWP and Issues Decision Document	November 30, 2020 to January 2021
Complete Remedial Action	March 2021 to August 2021
Draft Final Engineering Report (FER), Submit FER to NYSDEC and SMP (if needed)	September 2021
Certificate of Completion is Issued	November 2021

4.2.4 Work Hours

The hours for operation of remedial construction will conform to the City of Brooklyn Department of Buildings construction code requirements or according to specific variances issued by that agency. NYSDEC will be notified by the Applicant of any variances issued by the Department of Buildings.

4.2.5 Site Security

The Site will be secured with fences and locked gates.

4.2.6 Pre-Construction Meeting with NYSDEC

A pre-construction meeting will be held with NYSDEC prior to the start of major remedial construction activities.

4.2.7 Emergency Contact Information

An emergency contact sheet with names and phone numbers is included in **Table 4.3** below. That document will define the specific project contacts for use by NYSDEC and NYSDOH in the case of a day or night emergency.

Table 4.3: Emergency and Contact Numbers

Medical, Fire, and Police:	911
One Call Center:	(800) 272-4480 (3-day notice required for utility markout)
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
NYSDEC Spills Hotline	(800) 457-7362
Fuad Dahan – Remedial Engineer (SESI Consulting Engineers)	(973) 808-9050
Director of Construction	TBD

* Note: Contact numbers subject to change and will be updated as necessary

TBD – To Be Determined

4.3 Site Preparation

4.3.1 Mobilization

Mobilization tasks will include:

- Construction of temporary facilities and utilities;
- Set-up of construction equipment and facilities;
- Construction of fencing and barriers;
- Construction of erosion control measures; and
- Construction of decontamination and materials staging areas.

4.3.2 Erosion and Sedimentation Controls

Erosion and sediment control measures will be outlined in the SWPPP (see Section 4.1.4).

4.3.3 Utility Marker and Easements Layout

The Volunteer and its contractors will be 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 will 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.

4.3.4 Sheet piling and Shoring

A support of excavation (SOE) system, which may consist of sheet pile walls will be installed to support the excavation of the contaminated fill. The SOE may act as a hydraulic barrier for the contaminated groundwater.

The Volunteer and its contractors will be solely responsible for safe execution of all invasive and other work performed under this Plan and the implementation of safety measures (Sheet piling and Shoring) as necessary to maintain safe working environment. The Volunteer and its contractors will 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.

4.3.5 Dewatering

Dewatering is not anticipated to be required as part of this remedy because groundwater was identified at 34 to 38 ft-bgs. If groundwater is encountered, it will be treated as contaminated groundwater. The groundwater will be pumped for temporary storage in frac-tanks, which will be disposed of at an off-site facility. The disposal of the groundwater will follow the requirements of disposal facility for sampling and characterization.

4.3.6 Equipment and Material Staging

Equipment and material staging areas are expected to be relocated throughout the Site during remedial construction.

4.3.7 Decontamination Area

The decontamination area construction and operational requirements are provided in the HASP. Truck tires must be washed before exiting the Site.

4.3.8 Site Fencing

A construction safety fence is installed around the entire perimeter of the site. Access through gates will be provided at various points as required by the Volunteer and its contractors. These gates will be locked during non-construction hours.

4.3.9 Demobilization

Demobilization will include the following:

- Restoration of areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management area[s], 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.

4.4 Reporting

4.4.1 Weekly Reports

Weekly reports will be submitted to NYSDEC and NYSDOH Project Managers on Monday following the end of the week 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; and,
- 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.
- A description of any CAMP exceedances recorded, and actions taken to remedy any exceedances. In addition to the weekly reporting, any CAMP exceedances recorded will be reported to the NYSDEC and NYSDOH project managers on a daily basis.
- A description of CAMP noise, odor, and/or vibration complaints will be reported to the NYSDEC and NYSDOH project managers on a daily basis.

4.4.2 Other Reporting

Photographs will be taken of all remedial activities and the construction exit will be 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 submitted to NYSDEC on CD or other acceptable electronic media and will be sent to NYSDEC's Project Manager (2 copies) and to NYSDOH's Project Manager (1 copy). CD's will have a label and a general file inventory structure that separates photos into directories and sub-directories according to logical Remedial Action components. A photo log keyed to photo file ID numbers will be prepared to provide explanation for all representative photos.

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.

4.4.3 Complaint Management Plan

A public information board will be constructed at the perimeter of the Site. This information board will contain the phone number of the Volunteer where complaints may be directed. General information notices to the public will also be posted on this board for their benefit.

4.4.4 Deviations from the Remedial Action Work Plan

If there are any deviations from the RAWP, the following steps will be taken:

- Reasons for deviating from the approved RAWP will be identified and communicated directly to the NYSDEC Project Manager;
- All deviations will be communicated verbally and in writing (by letter or email) to the NYSDEC Project Manager;
- The deviations will be implemented based on verbal or written approval of the NYSDEC Project Manager. All verbal approvals will be followed-up in writing.
- The effect of the deviations on the overall remedy will be described/addressed in the FER.

5.0 REMEDIAL ACTION: MATERIAL REMOVAL FROM SITE

Removal of all contaminated soils under the Remedial Action for the Site will be implemented in accordance with the site-specific QAPP (**Appendix C**).

A plan depicting the locations where the excavation activities will be carried out is included as **Figure 5.1**.

5.1 Soil Cleanup Objectives

The Soil Cleanup Objectives for this Site are the unrestricted SCOs as listed in **Appendix E**.

Soil and materials management on-site will be conducted in accordance with the Soil Management Plan as described below (**Section 5.4**).

5.2 Remedial Performance Evaluation

5.2.1 End-Point Sampling Frequency

For all excavations, post-excavation soil and groundwater samples will be collected in accordance with Section 5.4 of DER-10.

5.2.2 Methodology

Soil samples will be collected in accordance with the QAPP using disposable gloves/trowels or dedicated, decontaminated stainless steel spoons.

5.2.3 Reporting of Results

The samples will be submitted to a NYSDEC certified laboratory. The results will be reported in accordance with NYSDEC requirements for Category B data deliverables (as outlined in DER-10).

5.2.4 QA/QC

Collection of QA/QC samples to evaluate potential cross-contamination from sampling equipment and during shipment of samples and repeatability of laboratory analytical practices will be in accordance with the QAPP included as **Appendix C**. Field blanks, trip blanks and duplicate samples associated with daily sampling activities will be collected as a part of the QA/QC practices.

5.2.5 DUSR

To ensure that the field sampling and laboratory analytical practices are acceptable, the data associated with all the samples will be validated by a third party (in accordance with requirements of DER-10). The validation approach and results will be presented in a DUSR to be included in the FER.

5.2.6 Reporting of End-Point Data in FER

The FER will include a table of end point data with highlights or a summary of exceedances of SCOs. A spider map showing all SCO exceedances will also be presented in the FER.

Chemical labs used for all end-point sample results and contingency sampling will be NYSDOH ELAP certified.

End point sampling, including bottom and side-wall sampling, will be performed in accordance with DER-10 sample frequency requirements. Side-wall samples will be collected a minimum of every 30 linear feet. Bottom samples will be collected at a rate of one for every 900 square feet. The FER will provide a tabular and map summary of all end-point sample results and exceedances of SCOs.

5.3 Estimated Material Removal Quantities

Source removal excavation activities will be implemented during the course of the redevelopment activities within the proposed building footprints and parking areas. Based on the RI, the depth of contaminated fill at the Site ranges to depths from grade – 19.5ft-bgs. The entire Site will be excavated to the depth of approximately 15 ft-bgs. In addition, “hotspot” excavations will be conducted to remove all soil exceedances of the URSCO in certain locations as shown on **Figure 5.1**. The specified depths for the Site in general and the hotspots are based on the vertical delineation with a clean sample during the RI. If the vertical delineation was not achieved during the RI, an additional foot was added to the depth of the deepest sample exceeding the USCO. Following the completion of the remedial excavation to the specified depth, end-point remedial performance sampling will be completed to ensure the Site meets USCOs or RRSCO before the Site development begins. Excavation will continue in one-foot lifts per area as shown on Figure 5.1 until the remedial objective of URSCO is achieved.

The estimated quantity of soil/fill to be removed from the Site is 15,000 to 20,000 CY. The actual excavated volume will be reported in the Final Engineering Report (FER) as a tally of the manifests and tickets of the soils disposed off-site.

5.4 Soil/Materials Management Plan

Approximately 15,000-20,000 CY of material may be required to be excavated during construction activities. Any required fill will consist of imported clean fill.

5.4.1 Soil Screening Methods

Visual, olfactory and PID soil screening and assessment will be performed by a qualified environmental professional during all remedial and development excavations into known or potentially contaminated material (Remaining Contamination Zone). 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 Certificate of Completion.

All primary contaminant sources 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 for Contaminated Soils

Stockpiles of contaminated materials, if needed, will be inspected at a minimum once each 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.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Soil stockpiles will be encircled with silt fences. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

5.4.3 Materials Excavation and Load Out

The Remediation 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 Applicant 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 has been investigated during the remedial investigation work. It has been determined that no risk or impediment to the planned work under this RAWP is posed by utilities or easements on the Site.

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).

A truck wash associated with construction activities will be operational during construction. The Remediation Engineer will be responsible for ensuring that all outbound trucks are not causing any off-site tracking of the contaminated soils.

Locations where vehicles enter or exit the Site will be inspected daily for evidence of off-Site sediment tracking.

The Remediation Engineer will ensure that all egress points for truck and equipment transported 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 RAWP.

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 will be included in the SoMP. All trucks loaded with Site materials will exit the Site using only these approved truck routes.

Proposed in-bound and out-bound truck routes to the Site will take 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; (f) overall safety in transport; and (g) community input, which was sought and obtained during the SEQRA EIS process

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.

A tracking pad will be installed at the Site egress to ensure clean-up of the soils from the truck tires. If needed, truck tires will be washed. Truck wash waters will be collected and disposed of off-Site in an appropriate manner.

5.4.5 Materials Disposal Off-Site

Approval from appropriate disposal facilities will be received prior to start of work. The total quantity of material expected to be disposed off-site is 15,000 to 20,000 CY.

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 will not be undertaken without formal NYSDEC approval.

Material that does not meet Track 1 unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

The following documentation will be obtained and reported by the Remedial Engineer for each disposal location 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 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 360-1.2

Historic fill and contaminated soils from the Site are prohibited from being disposed at Part 360-16 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 360-16 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 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 FER.

Hazardous wastes, if any, 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 will be performed for off-site disposal in a manner suitable to the receiving facility and in conformance with applicable permits. Sampling and analytical methods, sampling frequency, analytical results and QA/QC 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.

5.4.6 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. If any liquids need to be discharged into the sewer system, then approval by local utility authority and NYSDEC will be sought prior to the discharge. Dewatered fluids will not be recharged back to the land surface or subsurface of the Site without DEC approval.

Water generated during remedial construction will not be discharged to surface waters (i.e. a local pond, stream or river) without a SPDES permit.

5.4.7 Demarcation

A land survey will be performed by a New York State licensed surveyor, of the Site if a track 2 clean-up has been selected after the completion of related construction activities. The survey will define the top elevation of remaining contaminated soils. This survey will constitute the written record of the upper surface of the 'Remaining 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.

5.4.8 Backfill from Off-Site Sources

Backfilling is not expected. However, if necessary, material imported to be used on-site as backfill will be sampled at a frequency of, one composite sample per 500 cubic yards of material from each off-site borrow area. If more than 1,000 cubic yards of soil are needed from the same source area and both samples of the first 1,000 cubic yards meet the USCOs, the sample frequency will be reduced to one composite for every 2,500 cubic yards of additional soils from the same source, up to 5,000 cubic yards. For borrow sources greater than 5,000 cubic yards, sampling frequency may be reduced to one sample per 5,000 cubic yards, provided all earlier samples met the USCOs. The samples will be analyzed for target compound list (TCL) volatile

organic compounds (VOCs), TCL Semi-Volatile Organic Compounds (SVOCs), pesticides, PCBs, and TAL metals, including cyanide. In addition, composite samples will be collected for emerging contaminants in accordance with the NYSDEC Sampling, Analysis, and Assessment of Per-and-Polyfluoroalkyl Substances (October 2020).

The soil may be used as cover material provided that all parameters meet the URSCOs, per the NYSDEC regulatory requirements. The imported material, if needed, will be sampled in accordance with DER-10 Section 5.4 (e).

All materials proposed for import onto the Site, will meet the USCO, will be approved by the Remedial Engineer and will be in compliance with provisions in this RAWP prior to receipt at the Site. A "Soil Reuse/Import" form will be submitted to the NYSDEC for pre-approval prior to importing any soils on-Site. Bills of Lading or equivalent documentation will be obtained to track the amount soil arriving onto the Site and verify the source of soil being imported.

Material from industrial sites, spill sites, other environmental remediation sites or other potentially contaminated sites will not be imported to 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. 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 will be construed as an approval for this purpose.

Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, 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 will be construed as an approval for this purpose.

Solid waste will not be imported onto the Site. Trucks entering the Site with imported soils will be securely covered with tight fitting covers.

5.4.9 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. The Samples will be analyzed for full scan parameters (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides and PCBs, and emerging contaminants).

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.

5.4.10 Community Air Monitoring Plan

A copy of the CAMP for the Site is included as **Appendix D**. Exceedances observed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers and included in the Daily Report.

5.4.11 Odor, Dust and Nuisance Control Plan

Odor, dust and nuisance control will be in accordance with the site-specific Health and Safety Plan included as **Appendix B**.

The FER 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."

Odor Control Plan

This odor control plan is designed to control emissions of nuisance odors off-Site. 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 Applicant's Remediation Engineer, who is responsible for certifying the Final Engineering Report.

All necessary means will be employed to prevent on- and off-Site nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. 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 deodorants 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, as appropriate, by a combination of work stoppages, sheltering excavation and handling areas under tented containment structures equipped with appropriate air venting/filtering systems.

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:

- Dust suppression will be achieved through the use of a dedicated on-Site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing 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 truck sprinkling.

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 local noise control standards.

6.0 ENGINEERING CONTROLS

6.1 Monitored natural attenuation

6.1.1 Groundwater Monitoring System

A network of groundwater monitoring wells will be installed in locations approximate to the RI monitoring well network (see **Figure 2.4**) that will be utilized to monitor the groundwater quality and to demonstrate the reduction in groundwater contamination to asymptotic levels. As the dissolved groundwater impacts detected during the remedial investigation are relatively low, long-term monitoring program with associated institutional controls will be a cost effective remedial alternative to address these impacts.

Specifically, the groundwater samples will be collected annually, in accordance with requirement outlined in DER-10. The groundwater samples will be analyzed for VOCs, PAHs and metals.

This monitoring protocol will be described in the Site Management Plan.

6.1.2 Criteria for Completion of Remediation/Termination of Groundwater monitoring

Groundwater monitoring activities to assess natural attenuation will continue, as determined by the NYSDEC, until remaining groundwater COC concentrations are found to be consistently below NYSDEC standards or have become asymptotic at levels accepted by the NYSDEC over a period of time. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC. If groundwater contaminant levels become asymptotic at a level that is not acceptable to the NYSDEC, additional treatment and/or control measures will be evaluated. These monitoring activities will be outlined in the Monitoring Plan of the SMP.

6.2 Sub-Slab Depressurization System

A passive SSDS will be installed in any proposed building including the following elements:

- Venting layer: a layer of stone installed underneath the building slab;
- Pipes: A network of perforated pipes that are imbedded in the venting layer and connected with header pipes;

- Risers: the risers are solid pipes that are connected to the header pipes and vent to the outside of the building;
- Vapor barrier: a layer of impermeable membrane installed directly under the building slab and directly above the venting layer; and
- Sampling ports to collect sub slab soil vapor samples

The sub slab soil vapor samples will be collected on a yearly basis along with indoor air samples.

7.0 INSTITUTIONAL CONTROLS

In the event that the remedy does not achieve Track 1 unrestricted use, institutional controls in the form of an environmental easement will be imposed.

7.1 Environmental Easement

The intent of the remedy is to achieve a Track 1 unrestricted use. If the soil vapor intrusion (SVI) evaluation is not completed prior to the Final Engineering Report, then a Site Management Plan and Environmental Easement will be required to address the SVI evaluation and implement action as needed; if a mitigation or monitoring action is needed, a Track 1 cleanup can only be achieved if the mitigation system or other required action is no longer needed within 5 years of the date of the issuance of the Certificate of Completion (COC).

As part of this remedy, an Environmental Easement approved by NYSDEC will be filed and recorded with the Kings County Clerk. The Environmental Easement will be submitted as part of the FER.

The Environmental Easement renders the Site a Controlled Property. The Environmental Easement will be recorded with the Kings County Clerk before the Certificate of Completion is issued by NYSDEC. Groundwater monitoring will be performed as defined in the SMP, but there are no other engineering controls anticipated.

7.2 Site Management Plan

Site Management is the last phase of remediation and begins with the approval of the FER and issuance of the Certificate of Completion for the Remedial Action. If an SMP is needed because of remaining groundwater and soil vapor contamination, it will be submitted for approval prior to the approval of the FER. Site Management will not be discontinued unless prior written approval is granted by the NYSDEC and NYSDOH. The property owner is responsible to ensure that all Site Management responsibilities defined in the Environmental Easement and the Site Management Plan are performed.

The SMP is intended to provide a detailed description of the procedures required to manage the Site in the event that a Track 1 unrestricted use is not achieved. This includes: (1) development, implementation, and management of all Engineering and Institutional Controls; (2) development and implementation of a Monitoring Plan; (3) submittal of Site Management Reports, performance of inspections and certification of results, and demonstration of proper communication of Site information to NYSDEC; and (4) defining criteria for termination of monitoring. The SMP for this Site, if needed, will not require the development of a plan to operate

and maintain treatment, collection, containment, or recovery systems because the only proposed on-going remedy will be monitoring the wells and to evaluate soil vapor intrusion.

To address these needs, this SMP will include three plans as applicable: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; (2) a Monitoring Plan for implementation of Site Monitoring; and (3) 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 Draft DER-10 Technical Guidance for Site Investigation and Remediation, dated December 2002, and the guidelines provided by NYSDEC.

Site management activities, reporting, and EC/IC certification will be scheduled on a certification period basis. A Periodic Review Report (PRR) will be submitted to the NYSDEC beginning 16 months after the COC is issued. After the initial PRR, the next PRR will be submitted annually to the NYSDEC.

The SMP and the FER will include a monitoring plan for groundwater at the upgradient and the downgradient Site perimeter to evaluate Site-wide performance of the remedy. Groundwater monitoring wells will be installed immediately down-gradient of all remediation areas to monitor the natural attenuation. If the contaminants in groundwater do not attenuate below the Class GA AWQS concentrations or reach an asymptotic level that is accepted by the NYSDEC, an active treatment (e.g. oxidant injection) will be proposed and designed based on the monitoring data.

No exclusions for handling of remaining contaminated soils will be provided in the Site SMP. All handling of remaining contaminated material will be subject to provisions contained in the SMP.

8.0 FINAL ENGINEERING REPORT

A 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 FER will include as-built drawings for all constructed elements, certifications, manifests, and bills of lading. 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 FER review.

The FER 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 remaining contamination left on the Site after the remedy is complete. Remaining contamination includes all contamination that exceeds the Track 1 USCO in 6 NYCRR Part 375-6. A table that shows exceedances of Track 1 USCOs for all soil/fill remaining at the Site after the Remedial Action. A map that shows the location and summarizes exceedances of Track 1 USCOs 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 remaining 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 remaining contamination in excess of Site SCOs and a map that shows remaining contamination in excess of Site SCOs will be included in the FER.

The FER 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.

Before approval of a FER and issuance of a Certificate of Completion, all data generated in support of the FER shall be put in EQulS database software in accordance with NYSDEC's electronic data deliverable format and all project reports must be submitted in digital form on electronic media (PDF).

8.1 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 Fuad Dahan 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 _____ certify that I am currently a NYS registered professional engineer, I had primary direct responsibility for the implementation of the subject construction program, and I certify that the Remedial Work Plan was implemented and that all construction activities were completed in substantial conformance with the DER-approved Remedial Work Plan.

I certify that all use restrictions, institutional controls, engineering controls and/or any operation and maintenance requirements applicable to the site are contained in an environmental easement created and recorded pursuant to ECL 71-3605 and that any affected local governments, as defined in ECL 71-3603, have been notified that such easement has been recorded.

I certify that a Site Management Plan has been submitted for the continual and proper operation, maintenance, and monitoring of any engineering controls employed at the site including the proper maintenance of any remaining monitoring wells, and that such plan has been approved by DER.

TABLES

FIGURES

APPENDIX A
CITIZENS PARTICIPATION PLAN

APPENDIX B
HEALTH AND SAFETY PLAN

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

APPENDIX D
COMMUNITY AIR MONITORING PLAN

APPENDIX E

NYSDEC SOIL CLEANUP OBJECTIVES

TABLES

Table 1A
 Summary of Soil/Fill Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, New York

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-14(3-3.5)			SB-14(8-8.5)			SB-14(14.5-15)			SB-14(19-19.5)			SB-15(2-2.5)			SB-15(9-9.5)			SB-15(12.5-13)		
Lab Sample ID				460-182722-9			460-182722-10			460-182722-11			460-182722-12			460-182722-13			460-182722-14			460-182722-15		
Sampling Date/Time				05/22/2019 09:05:00			05/22/2019 09:15:00			05/22/2019 09:20:00			05/22/2019 09:25:00			05/22/2019 10:45:00			05/22/2019 10:50:00			05/22/2019 09:55:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil		
Analyte				Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
VOLATILES																								
m-Xylene & p-Xylene	mg/kg	NA	NA	0.00017	U	0.00017	0.00022	J	0.00022	0.00014	U	0.00014	0.0002	U	0.0002	0.00019	U	0.00019	0.00018	U	0.00018	0.00041	J	0.00017
o-Xylene	mg/kg	NA	NA	0.00009	U	0.00009	0.0002	J	0.00012	0.000076	U	0.000076	0.00011	U	0.00011	0.00011	U	0.00011	0.0001	U	0.0001	0.00034	J	0.000095
Styrene	mg/kg	NA	NA	0.00012	U	0.00012	0.0014		0.00015	0.000098	U	0.000098	0.00014	U	0.00014	0.00014	U	0.00014	0.00013	U	0.00013	0.00012	U	0.00012
Tetrachloroethene	mg/kg	1.3	19	0.00014	U	0.00014	0.00065	J	0.00018	0.00011	U	0.00011	0.00017	U	0.00017	0.00016	U	0.00016	0.00015	U	0.00015	0.00036	J	0.00014
Toluene	mg/kg	0.7	100	0.00059	U	0.00059	0.00077	U	0.00077	0.0005	U	0.0005	0.00073	U	0.00073	0.0007	U	0.0007	0.00066	U	0.00066	0.00062	U	0.00062
trans-1,2-Dichloroethene	mg/kg	0.19	100	0.00023	U	0.00023	0.0003	U	0.0003	0.0002	U	0.0002	0.00029	U	0.00029	0.00027	U	0.00027	0.00026	U	0.00026	0.00024	U	0.00024
trans-1,3-Dichloropropene	mg/kg	NA	NA	0.00025	U	0.00025	0.00033	U	0.00033	0.00021	U	0.00021	0.00031	U	0.00031	0.0003	U	0.0003	0.00028	U	0.00028	0.00026	U	0.00026
Trichloroethene	mg/kg	0.47	21	0.00014	U	0.00014	0.00018	U	0.00018	0.00012	U	0.00012	0.00017	U	0.00017	0.00016	U	0.00016	0.00015	U	0.00015	0.00014	U	0.00014
Trichlorofluoromethane	mg/kg	NA	NA	0.00039	U	0.00039	0.0005	U	0.0005	0.00032	U	0.00032	0.00047	U	0.00047	0.00045	U	0.00045	0.00043	U	0.00043	0.0004	U	0.0004
Vinyl chloride	mg/kg	0.02	0.9	0.00052	U	0.00052	0.00068	U	0.00068	0.00044	U	0.00044	0.00064	U	0.00064	0.00061	U	0.00061	0.00058	U	0.00058	0.00054	U	0.00054

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum detection limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1A
 Summary of Soil/Fill Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, New York

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-15(18-18.5)			SB-16(4-4.5)			SB-16(9.5-10)			SB-16(11.5-12)			SB-16(16-16.5)			SB-19(2-2.5)			SB-19(6-6.5)		
Lab Sample ID				460-182722-16			460-182722-5			460-182722-6			460-182722-7			460-182722-8			460-182722-1			460-182722-2		
Sampling Date/Time				05/22/2019 11:00:00			05/22/2019 08:15:00			05/22/2019 08:20:00			05/22/2019 08:30:00			05/22/2019 08:35:00			05/22/2019 07:55:00			05/22/2019 08:00:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
VOLATILES																								
m-Xylene & p-Xylene	mg/kg	NA	NA	0.00019	U	0.00019	0.00015	U	0.00015	0.00019	U	0.00019	0.0002	U	0.0002	0.00022	J	0.0002	0.00017	U	0.00017	0.00015	U	0.00015
o-Xylene	mg/kg	NA	NA	0.0001	U	0.0001	0.000081	U	0.000081	0.00011	U	0.00011	0.00011	U	0.00011	0.00027	J	0.00011	0.000092	U	0.000092	0.000081	U	0.000081
Styrene	mg/kg	NA	NA	0.00013	U	0.00013	0.0001	U	0.0001	0.00014	U	0.00014	0.00014	U	0.00014	0.00014	U	0.00014	0.00012	U	0.00012	0.0001	U	0.0001
Tetrachloroethene	mg/kg	1.3	19	0.00021	J	0.00015	0.00012	U	0.00012	0.00016	U	0.00016	0.00016	U	0.00016	0.00016	U	0.00016	0.00014	U	0.00014	0.00012	U	0.00012
Toluene	mg/kg	0.7	100	0.00068	U	0.00068	0.00053	U	0.00053	0.0007	U	0.0007	0.00071	U	0.00071	0.00071	U	0.00071	0.00061	U	0.00061	0.00053	U	0.00053
trans-1,2-Dichloroethene	mg/kg	0.19	100	0.00027	U	0.00027	0.00021	U	0.00021	0.00027	U	0.00027	0.00028	U	0.00028	0.00028	U	0.00028	0.00024	U	0.00024	0.00021	U	0.00021
trans-1,3-Dichloropropene	mg/kg	NA	NA	0.00029	U	0.00029	0.00023	U	0.00023	0.0003	U	0.0003	0.0003	U	0.0003	0.0003	U	0.0003	0.00026	U	0.00026	0.00023	U	0.00023
Trichloroethene	mg/kg	0.47	21	0.00016	U	0.00016	0.00012	U	0.00012	0.00016	U	0.00016	0.00016	U	0.00016	0.00016	U	0.00016	0.00014	U	0.00014	0.00012	U	0.00012
Trichlorofluoromethane	mg/kg	NA	NA	0.00044	U	0.00044	0.00035	U	0.00035	0.00045	U	0.00045	0.00046	U	0.00046	0.00046	U	0.00046	0.00039	U	0.00039	0.00035	U	0.00035
Vinyl chloride	mg/kg	0.02	0.9	0.00059	U	0.00059	0.00046	U	0.00046	0.00061	U	0.00061	0.00062	U	0.00062	0.00062	U	0.00062	0.00053	U	0.00053	0.00047	U	0.00047

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

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Table 1A
 Summary of Soil/Fill Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, New York

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-19(13.5-14)			SB-19(17-17.5)			SB-20(4.5-5)			SB-20(6.5-7)			SB-20(10.5-11)			SB-20(16-16.5)			SB-21 (1-1.5)		
Lab Sample ID				460-182722-3			460-182722-4			460-182722-17			460-182722-18			460-182722-19			460-182722-20			460-182616-1		
Sampling Date/Time				05/22/2019 08:05:00			05/22/2019 08:10:00			05/22/2019 11:15:00			05/22/2019 11:20:00			05/22/2019 11:25:00			05/22/2019 11:30:00			05/21/2019 13:00:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil					
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
VOLATILES																								
m-Xylene & p-Xylene	mg/kg	NA	NA	0.00016	U	0.00016	0.00016	U	0.00016	0.00016	U	0.00016	0.00025	U	0.00025	0.0002	U	0.0002	0.00017	U	0.00017	0.00017	U	0.00017
o-Xylene	mg/kg	NA	NA	0.000088	U	0.000088	0.000089	U	0.000089	0.000088	U	0.000088	0.00014	U	0.00014	0.00011	U	0.00011	0.000092	U	0.000092	0.000095	U	0.000095
Styrene	mg/kg	NA	NA	0.00011	U	0.00011	0.00012	U	0.00012	0.00011	U	0.00011	0.00018	U	0.00018	0.00014	U	0.00014	0.00012	U	0.00012	0.00012	U	0.00012
Tetrachloroethene	mg/kg	1.3	19	0.00013	U	0.00013	0.00013	U	0.00013	0.00013	U	0.00013	0.00056	J	0.00021	0.00016	U	0.00016	0.00014	U	0.00014	0.00014	U	0.00014
Toluene	mg/kg	0.7	100	0.00058	U	0.00058	0.00059	U	0.00059	0.00058	U	0.00058	0.00091	U	0.00091	0.00071	U	0.00071	0.0006	U	0.0006	0.00063	U	0.00063
trans-1,2-Dichloroethene	mg/kg	0.19	100	0.00023	U	0.00023	0.00023	U	0.00023	0.00023	U	0.00023	0.00036	U	0.00036	0.00028	U	0.00028	0.00024	U	0.00024	0.00025	U	0.00025
trans-1,3-Dichloropropene	mg/kg	NA	NA	0.00025	U	0.00025	0.00025	U	0.00025	0.00025	U	0.00025	0.00039	U	0.00039	0.0003	U	0.0003	0.00026	U	0.00026	0.00027	U	0.00027
Trichloroethene	mg/kg	0.47	21	0.00013	U	0.00013	0.00014	U	0.00014	0.00013	U	0.00013	0.00021	U	0.00021	0.00016	U	0.00016	0.00014	U	0.00014	0.00014	U	0.00014
Trichlorofluoromethane	mg/kg	NA	NA	0.00037	U	0.00037	0.00038	U	0.00038	0.00038	U	0.00038	0.00059	U	0.00059	0.00046	U	0.00046	0.00039	U	0.00039	0.00041	U	0.00041
Vinyl chloride	mg/kg	0.02	0.9	0.0005	U	0.0005	0.00051	U	0.00051	0.00051	U	0.00051	0.0008	U	0.0008	0.00062	U	0.00062	0.00053	U	0.00053	0.00055	U	0.00055

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum detection limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

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Table 1A
 Summary of Soil/Fill Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, New York

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-21 (7-7.5)			SB-21 (12.5-13)			SB-21 (18-18.5)			SB-22 (3.5-4)			SB-22 (6-6.5)			SB-22 (14-14.5)			SB-22 (16.5-17)		
Lab Sample ID				460-182616-2			460-182616-3			460-182616-4			460-182616-5			460-182616-6			460-182616-7			460-182616-8		
Sampling Date/Time				05/21/2019 13:10:00			05/21/2019 13:20:00			05/21/2019 13:30:00			05/21/2019 13:45:00			05/21/2019 13:50:00			05/21/2019 14:00:00			05/21/2019 14:05:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
VOLATILES																								
m-Xylene & p-Xylene	mg/kg	NA	NA	0.00015	U *	0.00015	0.00019	U	0.00019	0.0002	U	0.0002	0.00019	U	0.00019	0.00016	U	0.00016	0.00016	U	0.00016	0.00021	U	0.00021
o-Xylene	mg/kg	NA	NA	0.00008	U *	0.00008	0.0001	U	0.0001	0.00011	U	0.00011	0.0001	U	0.0001	0.00009	U	0.00009	0.000089	U	0.000089	0.00012	U	0.00012
Styrene	mg/kg	NA	NA	0.0001	U *	0.0001	0.00013	U	0.00013	0.00014	U	0.00014	0.00013	U	0.00013	0.00012	U	0.00012	0.00012	U	0.00012	0.00015	U	0.00015
Tetrachloroethene	mg/kg	1.3	19	0.00012	U *	0.00012	0.00016	U	0.00016	0.00017	U	0.00017	0.00016	U	0.00016	0.00014	U	0.00014	0.00013	U	0.00013	0.00018	U	0.00018
Toluene	mg/kg	0.7	100	0.00052	U *	0.00052	0.00068	U	0.00068	0.00072	U	0.00072	0.00068	U	0.00068	0.00059	U	0.00059	0.00059	U	0.00059	0.00077	U	0.00077
trans-1,2-Dichloroethene	mg/kg	0.19	100	0.00021	U *	0.00021	0.00027	U	0.00027	0.00028	U	0.00028	0.00027	U	0.00027	0.00023	U	0.00023	0.00023	U	0.00023	0.0003	U	0.0003
trans-1,3-Dichloropropene	mg/kg	NA	NA	0.00022	U *	0.00022	0.00029	U	0.00029	0.00031	U	0.00031	0.00029	U	0.00029	0.00025	U	0.00025	0.00025	U	0.00025	0.00033	U	0.00033
Trichloroethene	mg/kg	0.47	21	0.00012	U *	0.00012	0.00016	U	0.00016	0.00017	U	0.00017	0.00016	U	0.00016	0.00014	U	0.00014	0.00014	U	0.00014	0.00018	U	0.00018
Trichlorofluoromethane	mg/kg	NA	NA	0.00034	U *	0.00034	0.00044	U	0.00044	0.00047	U	0.00047	0.00044	U	0.00044	0.00038	U	0.00038	0.00038	U	0.00038	0.0005	U	0.0005
Vinyl chloride	mg/kg	0.02	0.9	0.00046	U *	0.00046	0.0006	U	0.0006	0.00063	U	0.00063	0.00059	U	0.00059	0.00052	U	0.00052	0.00051	U	0.00051	0.00067	U	0.00067

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

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Table 1A
 Summary of Soil/Fill Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, New York

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-23 (4-4.5)			SB-23 (6.5-7)			SB-23 (12.5-13.0)			SB-23 (19-19.5)			SB-29 (3-3.5)			SB-29 (7-7.5)			SB-29 (14.5-15)		
Lab Sample ID				460-182440-1			460-182440-2			460-182440-3			460-182440-4			460-182440-5			460-182440-6			460-182440-7		
Sampling Date/Time				05/20/2019 09:00:00			05/20/2019 09:05:00			05/20/2019 09:10:00			05/20/2019 09:15:00			05/20/2019 10:00:00			05/20/2019 10:05:00			05/20/2019 10:10:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
VOLATILES																								
m-Xylene & p-Xylene	mg/kg	NA	NA	0.00016	U	0.00016	0.00028	U	0.00028	0.00028	U	0.00028	0.00021	U	0.00021	0.00016	U	0.00016	0.00015	U	0.00015	0.00015	U	0.00015
o-Xylene	mg/kg	NA	NA	0.000086	U	0.000086	0.00015	U	0.00015	0.00016	U	0.00016	0.00011	U	0.00011	0.000088	U	0.000088	0.000084	U	0.000084	0.000083	U	0.000083
Styrene	mg/kg	NA	NA	0.00011	U	0.00011	0.0002	U	0.0002	0.0002	U	0.0002	0.00015	U	0.00015	0.00011	U	0.00011	0.00011	U	0.00011	0.00011	U	0.00011
Tetrachloroethene	mg/kg	1.3	19	0.00013	U	0.00013	0.00023	U	0.00023	0.00023	U	0.00023	0.00017	U	0.00017	0.00013	U	0.00013	0.00013	U	0.00013	0.00012	U	0.00012
Toluene	mg/kg	0.7	100	0.00057	U	0.00057	0.001	U	0.001	0.001	U	0.001	0.00076	U	0.00076	0.00058	U	0.00058	0.00055	U	0.00055	0.00054	U	0.00054
trans-1,2-Dichloroethene	mg/kg	0.19	100	0.00022	U	0.00022	0.0004	U	0.0004	0.0004	U	0.0004	0.0003	U	0.0003	0.00023	U	0.00023	0.00022	U	0.00022	0.00021	U	0.00021
trans-1,3-Dichloropropene	mg/kg	NA	NA	0.00024	U	0.00024	0.00043	U	0.00043	0.00043	U	0.00043	0.00032	U	0.00032	0.00025	U	0.00025	0.00024	U	0.00024	0.00023	U	0.00023
Trichloroethene	mg/kg	0.47	21	0.00013	U	0.00013	0.00023	U	0.00023	0.00024	U	0.00024	0.00017	U	0.00017	0.00013	U	0.00013	0.00013	U	0.00013	0.00013	U	0.00013
Trichlorofluoromethane	mg/kg	NA	NA	0.00037	U	0.00037	0.00065	U	0.00065	0.00066	U	0.00066	0.00049	U	0.00049	0.00038	U	0.00038	0.00036	U	0.00036	0.00035	U	0.00035
Vinyl chloride	mg/kg	0.02	0.9	0.00049	U	0.00049	0.00088	U	0.00088	0.00089	U	0.00089	0.00066	U	0.00066	0.00051	U	0.00051	0.00048	U	0.00048	0.00048	U	0.00048

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum detection limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1A
 Summary of Soil/Fill Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, New York

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-29 (18-18.5)			SB-30 (2-2.5)			SB-30 (8.5-9.0)			SB-30 (16.5-17.0)			SB-30 (13-13.5)			SB-31 (1-1.5)			SB-31 (9-9.5)		
Lab Sample ID				460-182440-8			460-182440-9			460-182440-10			460-182440-11			460-182440-12			460-182440-13			460-182440-14		
Sampling Date/Time				05/20/2019 10:15:00			05/20/2019 09:20:00			05/20/2019 09:25:00			05/20/2019 09:35:00			05/20/2019 09:30:00			05/20/2019 09:40:00			05/20/2019 09:45:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
VOLATILES																								
m-Xylene & p-Xylene	mg/kg	NA	NA	0.00021	U	0.00021	0.00022	U	0.00022	0.00018	U	0.00018	0.00016	U	0.00016	0.00021	U	0.00021	0.00015	U	0.00015	0.00023	U	0.00023
o-Xylene	mg/kg	NA	NA	0.00011	U	0.00011	0.00012	U	0.00012	0.000099	U	0.000099	0.000091	J	0.00009	0.00011	U	0.00011	0.000082	U	0.000082	0.00012	U	0.00012
Styrene	mg/kg	NA	NA	0.00015	U	0.00015	0.00016	U	0.00016	0.00013	U	0.00013	0.00012	U	0.00012	0.00015	U	0.00015	0.00011	U	0.00011	0.00016	U	0.00016
Tetrachloroethene	mg/kg	1.3	19	0.00017	U	0.00017	0.00018	U	0.00018	0.00023	J	0.00015	0.00061	J	0.00013	0.00017	U	0.00017	0.00012	U	0.00012	0.0014		0.00019
Toluene	mg/kg	0.7	100	0.00074	U	0.00074	0.00079	U	0.00079	0.00065	U	0.00065	0.00059	U	0.00059	0.00074	U	0.00074	0.00054	U	0.00054	0.00082	U	0.00082
trans-1,2-Dichloroethene	mg/kg	0.19	100	0.00029	U	0.00029	0.00031	U	0.00031	0.00026	U	0.00026	0.00023	U	0.00023	0.00029	U	0.00029	0.00021	U	0.00021	0.00032	U	0.00032
trans-1,3-Dichloropropene	mg/kg	NA	NA	0.00032	U	0.00032	0.00034	U	0.00034	0.00028	U	0.00028	0.00025	U	0.00025	0.00031	U	0.00031	0.00023	U	0.00023	0.00035	U	0.00035
Trichloroethene	mg/kg	0.47	21	0.00017	U	0.00017	0.00018	U	0.00018	0.00015	U	0.00015	0.00014	U	0.00014	0.00017	U	0.00017	0.00012	U	0.00012	0.00019	U	0.00019
Trichlorofluoromethane	mg/kg	NA	NA	0.00048	U	0.00048	0.00051	U	0.00051	0.00042	U	0.00042	0.00038	U	0.00038	0.00048	U	0.00048	0.00035	U	0.00035	0.00053	U	0.00053
Vinyl chloride	mg/kg	0.02	0.9	0.00065	U	0.00065	0.00069	U	0.00069	0.00057	U	0.00057	0.00051	U	0.00051	0.00065	U	0.00065	0.00047	U	0.00047	0.00071	U	0.00071

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum detection limit

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* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

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F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1A
 Summary of Soil/Fill Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, New York

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-31 (11-11.5)			SB-31 (16.5-17)			SB-32 (4-4.5)			SB-32 (7-7.5)			SB-32 (14.5-15)			SB-32 (18-18.5)			SB-33 (3.5-4.0)		
Lab Sample ID				460-182440-15			460-182440-16			460-182440-17			460-182440-18			460-182440-19			460-182440-20			460-182440-21		
Sampling Date/Time				05/20/2019 09:50:00			05/20/2019 09:55:00			05/20/2019 10:20:00			05/20/2019 10:22:00			05/20/2019 10:25:00			05/20/2019 10:30:00			05/20/2019 10:35:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil					
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
VOLATILES																								
m-Xylene & p-Xylene	mg/kg	NA	NA	0.00018	U	0.00018	0.00017	U	0.00017	0.00018	U	0.00018	0.00018	U	0.00018	0.00019	U	0.00019	0.00016	U	0.00016	0.00016	U	0.00016
o-Xylene	mg/kg	NA	NA	0.0001	U	0.0001	0.000093	U	0.000093	0.0001	U	0.0001	0.000097	U	0.000097	0.00011	U	0.00011	0.000089	U	0.000089	0.000086	U	0.000086
Styrene	mg/kg	NA	NA	0.00013	U	0.00013	0.00012	U	0.00012	0.00013	U	0.00013	0.00013	U	0.00013	0.00014	U	0.00014	0.00012	U	0.00012	0.00011	U	0.00011
Tetrachloroethene	mg/kg	1.3	19	0.0011		0.00015	0.00029	J	0.00014	0.00015	U	0.00015	0.00015	U	0.00015	0.00016	U	0.00016	0.00013	U	0.00013	0.00013	U	0.00013
Toluene	mg/kg	0.7	100	0.00066	U	0.00066	0.00061	U	0.00061	0.00066	U	0.00066	0.00064	U	0.00064	0.00069	U	0.00069	0.00059	U	0.00059	0.00056	U	0.00056
trans-1,2-Dichloroethene	mg/kg	0.19	100	0.00026	U	0.00026	0.00024	U	0.00024	0.00026	U	0.00026	0.00025	U	0.00025	0.00027	U	0.00027	0.00023	U	0.00023	0.00022	U	0.00022
trans-1,3-Dichloropropene	mg/kg	NA	NA	0.00028	U	0.00028	0.00026	U	0.00026	0.00028	U	0.00028	0.00027	U	0.00027	0.00029	U	0.00029	0.00025	U	0.00025	0.00024	U	0.00024
Trichloroethene	mg/kg	0.47	21	0.00015	U	0.00015	0.00014	U	0.00014	0.00015	U	0.00015	0.00015	U	0.00015	0.00016	U	0.00016	0.00014	U	0.00014	0.00013	U	0.00013
Trichlorofluoromethane	mg/kg	NA	NA	0.00043	U	0.00043	0.0004	U	0.0004	0.00043	U	0.00043	0.00042	U	0.00042	0.00045	U	0.00045	0.00038	U	0.00038	0.00037	U	0.00037
Vinyl chloride	mg/kg	0.02	0.9	0.00057	U	0.00057	0.00053	U	0.00053	0.00058	U	0.00058	0.00056	U	0.00056	0.0006	U	0.0006	0.00051	U	0.00051	0.00049	U	0.00049

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

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F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

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Table 1A
 Summary of Soil/Fill Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, New York

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-33 (7.5-8.0)			SB-33 (11.5-12)			SB-33 (17.0-17.5)			SB-34 (1.5-2.0)			SB-34 (9-9.5)			SB-34 (13-13.5)			SB-34 (15.5-16.0)		
Lab Sample ID				460-182440-22			460-182440-23			460-182440-24			460-182440-25			460-182440-26			460-182440-27			460-182440-28		
Sampling Date/Time				05/20/2019 10:40:00			05/20/2019 10:45:00			05/20/2019 10:50:00			05/20/2019 12:00:00			05/20/2019 12:05:00			05/20/2019 12:10:00			05/20/2019 12:15:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
VOLATILES																								
m-Xylene & p-Xylene	mg/kg	NA	NA	0.00019	U	0.00019	0.00019	U	0.00019	0.00016	U	0.00016	0.00017	U	0.00017	0.00018	U	0.00018	0.00022	U	0.00022	0.00017	U	0.00017
o-Xylene	mg/kg	NA	NA	0.0001	U	0.0001	0.0001	U	0.0001	0.000088	U	0.000088	0.000095	U	0.000095	0.0001	U	0.0001	0.00012	U	0.00012	0.000093	U	0.000093
Styrene	mg/kg	NA	NA	0.00013	U	0.00013	0.00014	U	0.00014	0.00011	U	0.00011	0.00012	U	0.00012	0.00013	U	0.00013	0.00016	U	0.00016	0.00012	U	0.00012
Tetrachloroethene	mg/kg	1.3	19	0.00015	U	0.00015	0.00016	U	0.00016	0.00014	J	0.00013	0.00015	J	0.00014	0.00015	U	0.00015	0.00023	J	0.00018	0.00017	J	0.00014
Toluene	mg/kg	0.7	100	0.00067	U	0.00067	0.00069	U	0.00069	0.00058	U	0.00058	0.00062	U	0.00062	0.00066	U	0.00066	0.0008	U	0.0008	0.00061	U	0.00061
trans-1,2-Dichloroethene	mg/kg	0.19	100	0.00026	U	0.00026	0.00027	U	0.00027	0.00023	U	0.00023	0.00025	U	0.00025	0.00026	U	0.00026	0.00031	U	0.00031	0.00024	U	0.00024
trans-1,3-Dichloropropene	mg/kg	NA	NA	0.00029	U	0.00029	0.00029	U	0.00029	0.00025	U	0.00025	0.00027	U	0.00027	0.00028	U	0.00028	0.00034	U	0.00034	0.00026	U	0.00026
Trichloroethene	mg/kg	0.47	21	0.00015	U	0.00015	0.00016	U	0.00016	0.00013	U	0.00013	0.00014	U	0.00014	0.00015	U	0.00015	0.00018	U	0.00018	0.00014	U	0.00014
Trichlorofluoromethane	mg/kg	NA	NA	0.00044	U	0.00044	0.00045	U	0.00045	0.00038	U	0.00038	0.0004	U	0.0004	0.00043	U	0.00043	0.00052	U	0.00052	0.0004	U	0.0004
Vinyl chloride	mg/kg	0.02	0.9	0.00059	U	0.00059	0.0006	U	0.0006	0.00051	U	0.00051	0.00054	U	0.00054	0.00058	U	0.00058	0.0007	U	0.0007	0.00053	U	0.00053

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

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Table 1A
 Summary of Soil/Fill Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, New York

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-35 (4.5-5.0)			SB-35 (19-19.5)			SB-35 (8-8.5)			SB-35 (13.5-14.0)			SB-36 (2-2.5)			SB-36 (6-6.5)			SB-36 (13-13.5)					
Lab Sample ID				460-182440-29			460-182440-30			460-182440-31			460-182440-32			460-182440-33			460-182440-34			460-182440-35					
Sampling Date/Time				05/20/2019 12:20:00			05/20/2019 12:35:00			05/20/2019 12:25:00			05/20/2019 12:30:00			05/20/2019 12:40:00			05/20/2019 12:45:00			05/20/2019 12:50:00					
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil					
Analyte	Result			Q			MDL			Result			Q			MDL			Result			Q			MDL		
VOLATILES																											
m-Xylene & p-Xylene	mg/kg	NA	NA	0.00017	U	0.00017	0.00019	U	0.00019	0.00032	J	0.00017	0.00018	U	0.00018	0.00022	U	0.00022	0.00019	U	0.00019	0.00015	U	0.00015			
o-Xylene	mg/kg	NA	NA	0.000091	U	0.000091	0.0001	U	0.0001	0.00028	J	0.000093	0.0001	U	0.0001	0.00012	U	0.00012	0.0001	U	0.0001	0.000081	U	0.000081			
Styrene	mg/kg	NA	NA	0.00012	U	0.00012	0.00013	U	0.00013	0.00012	U	0.00012	0.00013	U	0.00013	0.00016	U	0.00016	0.00013	U	0.00013	0.0001	U	0.0001			
Tetrachloroethene	mg/kg	1.3	19	0.0042		0.00014	0.00015	U	0.00015	0.0054		0.00014	0.00028	J	0.00015	0.00035	J	0.00018	0.00049	J	0.00015	0.00065	J	0.00012			
Toluene	mg/kg	0.7	100	0.0006	U	0.0006	0.00068	U	0.00068	0.00061	U	0.00061	0.00065	U	0.00065	0.00079	U	0.00079	0.00067	U	0.00067	0.00053	U	0.00053			
trans-1,2-Dichloroethene	mg/kg	0.19	100	0.00024	U	0.00024	0.00027	U	0.00027	0.00024	U	0.00024	0.00026	U	0.00026	0.00031	U	0.00031	0.00026	U	0.00026	0.00021	U	0.00021			
trans-1,3-Dichloropropene	mg/kg	NA	NA	0.00026	U	0.00026	0.00029	U	0.00029	0.00026	U	0.00026	0.00028	U	0.00028	0.00034	U	0.00034	0.00029	U	0.00029	0.00023	U	0.00023			
Trichloroethene	mg/kg	0.47	21	0.00014	U	0.00014	0.00016	U	0.00016	0.00014	U	0.00014	0.00015	U	0.00015	0.00018	U	0.00018	0.00015	U	0.00015	0.00012	U	0.00012			
Trichlorofluoromethane	mg/kg	NA	NA	0.00039	U	0.00039	0.00044	U	0.00044	0.0004	U	0.0004	0.00043	U	0.00043	0.00051	U	0.00051	0.00044	U	0.00044	0.00035	U	0.00035			
Vinyl chloride	mg/kg	0.02	0.9	0.00052	U	0.00052	0.00059	U	0.00059	0.00054	U	0.00054	0.00057	U	0.00057	0.00069	U	0.00069	0.00059	U	0.00059	0.00046	U	0.00046			

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

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Table 1A
 Summary of Soil/Fill Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, New York

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-36 (17-17.5)			TP-5(4.5-5.0)			TP-5(9.5-10.0)			TP-5(12-12.5)			TP-6(4.5-5.0)			TP-6(9-9.5)			TP-6(11-11.5)		
Lab Sample ID				460-182440-36			460-182779-1			460-182779-2			460-182779-3			460-182779-4			460-182779-5			460-182779-6		
Sampling Date/Time				05/20/2019 12:55:00			05/23/2019 12:20:00			05/23/2019 12:35:00			05/23/2019 12:45:00			05/23/2019 14:30:00			05/23/2019 14:35:00			05/23/2019 14:45:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil		
Analyte				Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
VOLATILES																								
m-Xylene & p-Xylene	mg/kg	NA	NA	0.0002	U	0.0002	0.00019	U	0.00019	0.00026	U	0.00026	0.0002	U	0.0002	0.0002	U	0.0002	0.00021	U	0.00021	0.00017	U	0.00017
o-Xylene	mg/kg	NA	NA	0.00011	U	0.00011	0.0001	U	0.0001	0.00014	U	0.00014	0.00011	U	0.00011	0.00011	U	0.00011	0.00011	U	0.00011	0.000095	U	0.000095
Styrene	mg/kg	NA	NA	0.00014	U	0.00014	0.00013	U	0.00013	0.00018	U	0.00018	0.00014	U	0.00014	0.00014	U	0.00014	0.00015	U	0.00015	0.00012	U	0.00012
Tetrachloroethene	mg/kg	1.3	19	0.00017	U	0.00017	0.00015	U	0.00015	0.00021	U	0.00021	0.00016	U	0.00016	0.00017	U	0.00017	0.00017	U	0.00017	0.00014	U	0.00014
Toluene	mg/kg	0.7	100	0.00073	U	0.00073	0.00067	U	0.00067	0.00092	U	0.00092	0.0007	U	0.0007	0.00072	U	0.00072	0.00075	U	0.00075	0.00063	U	0.00063
trans-1,2-Dichloroethene	mg/kg	0.19	100	0.00029	U	0.00029	0.00026	U	0.00026	0.00036	U	0.00036	0.00028	U	0.00028	0.00028	U	0.00028	0.0003	U	0.0003	0.00025	U	0.00025
trans-1,3-Dichloropropene	mg/kg	NA	NA	0.00031	U	0.00031	0.00029	U	0.00029	0.00039	U	0.00039	0.0003	U	0.0003	0.00031	U	0.00031	0.00032	U	0.00032	0.00027	U	0.00027
Trichloroethene	mg/kg	0.47	21	0.00017	U	0.00017	0.00015	U	0.00015	0.00021	U	0.00021	0.00016	U	0.00016	0.00017	U	0.00017	0.00017	U	0.00017	0.00014	U	0.00014
Trichlorofluoromethane	mg/kg	NA	NA	0.00047	U	0.00047	0.00044	U	0.00044	0.0006	U	0.0006	0.00046	U	0.00046	0.00047	U	0.00047	0.00049	U	0.00049	0.00041	U	0.00041
Vinyl chloride	mg/kg	0.02	0.9	0.00064	U	0.00064	0.00059	U	0.00059	0.00081	U	0.00081	0.00062	U	0.00062	0.00063	U	0.00063	0.00065	U	0.00065	0.00055	U	0.00055

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum detection limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1A
 Summary of Soil/Fill Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, New York

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	TP-7(4.5-5.0)			TP-7(8-8.5)			TP-7(10-10.5)			DUP-1			DUP-2			DUP-3			
Lab Sample ID				460-182779-7			460-182779-8			460-182779-9			460-182440-37			460-182616-9			460-182722-21			
Sampling Date/Time				05/23/2019 12:55:00			05/23/2019 13:05:00			05/23/2019 13:15:00			05/20/2019 00:00:00			05/21/2019 00:00:00			05/22/2019 00:00:00			
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
VOLATILES																						
m-Xylene & p-Xylene	mg/kg	NA	NA	0.00026	U	0.00026	0.00028	U	0.00028	0.00023	U	0.00023	0.0002	U	0.0002	0.00025	U	0.00025	0.00023	U	0.00023	
o-Xylene	mg/kg	NA	NA	0.00014	U	0.00014	0.00015	U	0.00015	0.00013	U	0.00013	0.00011	U	0.00011	0.00013	U	0.00013	0.00013	U	0.00013	
Styrene	mg/kg	NA	NA	0.00018	U	0.00018	0.0002	U	0.0002	0.00016	U	0.00016	0.00014	U	0.00014	0.00017	U	0.00017	0.00017	U	0.00017	
Tetrachloroethene	mg/kg	1.3	19	0.00021	U	0.00021	0.00031	J	0.00023	0.00063	J	0.00019	0.00016	U	0.00016	0.0002	U	0.0002	0.00019	U	0.00019	
Toluene	mg/kg	0.7	100	0.00093	U	0.00093	0.001	U	0.001	0.00083	U	0.00083	0.0007	U	0.0007	0.00088	U	0.00088	0.00084	U	0.00084	
trans-1,2-Dichloroethene	mg/kg	0.19	100	0.00037	U	0.00037	0.00039	U	0.00039	0.00033	U	0.00033	0.00028	U	0.00028	0.00035	U	0.00035	0.00033	U	0.00033	
trans-1,3-Dichloropropene	mg/kg	NA	NA	0.0004	U	0.0004	0.00042	U	0.00042	0.00035	U	0.00035	0.0003	U	0.0003	0.00038	U	0.00038	0.00036	U	0.00036	
Trichloroethene	mg/kg	0.47	21	0.00021	U	0.00021	0.00023	U	0.00023	0.00019	U	0.00019	0.00016	U	0.00016	0.0002	U	0.0002	0.00019	U	0.00019	
Trichlorofluoromethane	mg/kg	NA	NA	0.00061	U	0.00061	0.00065	U	0.00065	0.00054	U	0.00054	0.00046	U	0.00046	0.00057	U	0.00057	0.00055	U	0.00055	
Vinyl chloride	mg/kg	0.02	0.9	0.00081	U	0.00081	0.00087	U	0.00087	0.00073	U	0.00073	0.00061	U	0.00061	0.00077	U	0.00077	0.00074	U	0.00074	

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum detection limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1B
 Summary of Soil/Fill Sampling Results
 Semi-Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-14(3-3.5)			SB-14(8-8.5)			SB-14(14.5-15)			SB-14(19-19.5)			SB-15(2-2.5)			SB-15(9-9.5)			SB-15(12.5-13)			SB-15(18-18.5)			SB-16(4-4.5)			SB-16(9.5-10)		
Lab Sample ID				460-182722-9			460-182722-10			460-182722-11			460-182722-12			460-182722-13			460-182722-14			460-182722-15			460-182722-16			460-182722-5			460-182722-6		
Sampling Date/Time				05/22/2019 09:05:00			05/22/2019 09:15:00			05/22/2019 09:20:00			05/22/2019 09:25:00			05/22/2019 10:45:00			05/22/2019 10:50:00			05/22/2019 09:55:00			05/22/2019 11:00:00			05/22/2019 08:15:00			05/22/2019 08:20:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL			
SEMIVOLATILES																																	
N-Nitrosodiphenylamine	mg/kg	NA	NA	0.0076	U	0.0076	0.0096	U	0.0096	0.0069	U	0.0069	0.0071	U	0.0071	0.037	U	0.037	0.044	U	0.044	0.0079	U	0.0079	0.0072	U	0.0072	0.0075	U	0.0075	0.0078	U	0.0078
Pentachlorophenol	mg/kg	0.8	6.7	0.082	U	0.082	0.1	U	0.1	0.074	U F1	0.074	0.076	U	0.076	0.39	U	0.39	0.47	U	0.47	0.085	U	0.085	0.077	U	0.077	0.08	U	0.08	0.084	U	0.084
Phenanthrene	mg/kg	100	100	1.4		0.007	1.1		0.0088	0.0064	U	0.0064	0.022	J	0.0065	7.9		0.034	5.7		0.04	6.1		0.0073	0.0066	U	0.0066	4		0.0069	2		0.0072
Phenol	mg/kg	0.33	100	0.0059	U	0.0059	0.0075	U	0.0075	0.0054	U	0.0054	0.0055	U	0.0055	0.028	U	0.028	0.034	U	0.034	0.0061	U	0.0061	0.0056	U	0.0056	0.0058	U	0.0058	0.006	U	0.006
Pyrene	mg/kg	100	100	2.7		0.0099	2.4		0.013	0.009	U	0.009	0.051	J	0.0092	13		0.048	5.6		0.057	7		0.01	0.0094	U	0.0094	6.2		0.0097	3.2		0.01

Notes:
 SB-14(3-3.5) - Sample ID(Sample Depth)
 mg/kg - milligrams per kilogram
 Q - Laboratory Qualifier
BOLD - Constituent detected above laboratory Minimum Detection Limit
 SCO - Soil Cleanup Objective
Detected above the Unrestricted Use SCO
Detected above the Restricted Residential SCO
 MDL - Minimum Detection Limit
 J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value
 U - Indicates the constituent was analyzed for but not detected
 * - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits
 B - Constituent was found in the laboratory blank and the sample
 F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits
 F2 - MS/MSD relative percent difference exceeds the control limits

Table 1B
 Summary of Soil/Fill Sampling Results
 Semi-Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-16(11.5-12)			SB-16(16-16.5)			SB-19(2-2.5)			SB-19(6-6.5)			SB-19(13.5-14)			SB-19(17-17.5)			SB-20(4.5-5)			SB-20(6.5-7)			SB-20(10.5-11)			SB-20(16-16.5)														
Lab Sample ID				460-182722-7			460-182722-8			460-182722-1			460-182722-2			460-182722-3			460-182722-4			460-182722-17			460-182722-18			460-182722-19			460-182722-20														
Sampling Date/Time				05/22/2019 08:30:00			05/22/2019 08:35:00			05/22/2019 07:55:00			05/22/2019 08:00:00			05/22/2019 08:05:00			05/22/2019 08:10:00			05/22/2019 11:15:00			05/22/2019 11:20:00			05/22/2019 11:25:00			05/22/2019 11:30:00														
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil														
Analyte	Result			Q			MDL			Result			Q			MDL			Result			Q			MDL			Result			Q			MDL			Result			Q			MDL		
SEMIVOLATILES																																													
N-Nitrosodiphenylamine	mg/kg	NA	NA	0.0073	U	0.0073	0.008	U	0.008	0.0073	U	0.0073	0.0074	U	0.0074	0.0072	U	0.0072	0.0074	U	0.0074	0.63	J	0.07	0.041	U	0.041	0.0067	U	0.0067	0.0065	U	0.0065												
Pentachlorophenol	mg/kg	0.8	6.7	0.078	U	0.078	0.086	U	0.086	0.078	U	0.078	0.079	U	0.079	0.077	U	0.077	0.08	U	0.08	0.75	U	0.75	0.44	U	0.44	0.072	U	0.072	0.07	U	0.07												
Phenanthrene	mg/kg	100	100	0.0067	U	0.0067	2.4		0.0074	0.21	J	0.0067	0.0068	U	0.0068	0.0066	U	0.0066	0.033	J	0.0068	45		0.064	3.7		0.038	1.5		0.0062	0.006	U	0.006												
Phenol	mg/kg	0.33	100	0.0057	U	0.0057	0.0062	U	0.0062	0.0057	U	0.0057	0.0057	U	0.0057	0.0056	U	0.0056	0.0058	U	0.0058	0.054	U	0.054	0.032	U	0.032	0.0052	U	0.0052	0.005	U	0.005												
Pyrene	mg/kg	100	100	0.0095	U	0.0095	3.2		0.01	0.44		0.0095	0.0096	U	0.0096	0.0094	U	0.0094	0.041	J	0.0097	52		0.091	4.4		0.054	1.7		0.0088	0.0085	U	0.0085												

Notes:
 SB-14(3-3.5) - Sample ID(Sample Depth)
 mg/kg - milligrams per kilogram
 Q - Laboratory Qualifier
BOLD - Constituent detected above laboratory Minimum Detection Limit
 SCO - Soil Cleanup Objective
 Detected above the Unrestricted Use SCO
 Detected above the Restricted Residential SCO
 MDL - Minimum Detection Limit
 J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value
 U - Indicates the constituent was analyzed for but not detected
 * - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits
 B - Constituent was found in the laboratory blank and the sample
 F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits
 F2 - MS/MSD relative percent difference exceeds the control limits

Table 1B
Summary of Soil/Fill Sampling Results
Semi-Volatile Organic Compounds
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-21 (1-1.5)			SB-21 (7-7.5)			SB-21 (12.5-13)			SB-21 (18-18.5)			SB-22 (3.5-4)			SB-22 (6-6.5)			SB-22 (14-14.5)			SB-22 (16.5-17)			SB-23 (4-4.5)			SB-23 (6.5-7)		
Lab Sample ID				460-182616-1			460-182616-2			460-182616-3			460-182616-4			460-182616-5			460-182616-6			460-182616-7			460-182616-8			460-182440-1			460-182440-2		
Sampling Date/Time				05/21/2019 13:00:00			05/21/2019 13:10:00			05/21/2019 13:20:00			05/21/2019 13:30:00			05/21/2019 13:45:00			05/21/2019 13:50:00			05/21/2019 14:00:00			05/21/2019 14:05:00			05/20/2019 09:00:00			05/20/2019 09:05:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil		
Analyte				Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
SEMIVOLATILES																																	
N-Nitrosodiphenylamine	mg/kg	NA	NA	0.0075	U	0.0075	0.007	U	0.007	0.007	U	0.007	0.0069	U	0.0069	0.0077	U	0.0077	0.0073	U	0.0073	0.007	U	0.007	0.0067	U	0.0067	0.0064	U	0.0064	0.0085	U	0.0085
Pentachlorophenol	mg/kg	0.8	6.7	0.081	U	0.081	0.075	U	0.075	0.075	U	0.075	0.074	U	0.074	0.083	U	0.083	0.079	U	0.079	0.075	U	0.075	0.072	U	0.072	0.069	U	0.069	0.091	U	0.091
Phenanthrene	mg/kg	100	100	0.33	J	0.0069	0.0064	U	0.0064	0.0065	U	0.0065	0.0063	U	0.0063	7.7	J	0.0071	0.0067	U	0.0067	0.0065	U	0.0065	0.0062	U	0.0062	1.3	J	0.0059	5.4	J	0.0078
Phenol	mg/kg	0.33	100	0.0058	U	0.0058	0.0054	U	0.0054	0.0054	U	0.0054	0.0053	U	0.0053	0.037	J	0.006	0.0057	U	0.0057	0.0055	U	0.0055	0.0052	U	0.0052	0.038	J	0.005	0.0066	U	0.0066
Pyrene	mg/kg	100	100	0.71	J	0.0098	0.0091	U	0.0091	0.0091	U	0.0091	0.0089	U	0.0089	7.4	J	0.01	0.0095	U	0.0095	0.0092	U	0.0092	0.0088	U	0.0088	2.1	J	0.0083	7.2	J	0.011

Notes:
SB-14(3-3.5) - Sample ID(Sample Depth)
mg/kg - milligrams per kilogram
Q - Laboratory Qualifier
BOLD - Constituent detected above laboratory Minimum Detection Limit
SCO - Soil Cleanup Objective
Detected above the Unrestricted Use SCO
Detected above the Restricted Residential SCO
MDL - Minimum Detection Limit
J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value
U - Indicates the constituent was analyzed for but not detected
* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits
B - Constituent was found in the laboratory blank and the sample
F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits
F2 - MS/MSD relative percent difference exceeds the control limits

Table 1B
 Summary of Soil/Fill Sampling Results
 Semi-Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-23 (12.5-13.0)			SB-23 (19-19.5)			SB-29 (3-3.5)			SB-29 (7-7.5)			SB-29 (14.5-15)			SB-29 (18-18.5)			SB-30 (2-2.5)			SB-30 (8.5-9.0)			SB-30 (16.5-17.0)			SB-30 (13-13.5)														
Lab Sample ID				460-182440-3			460-182440-4			460-182440-5			460-182440-6			460-182440-7			460-182440-8			460-182440-9			460-182440-10			460-182440-11			460-182440-12														
Sampling Date/Time				05/20/2019 09:10:00			05/20/2019 09:15:00			05/20/2019 10:00:00			05/20/2019 10:05:00			05/20/2019 10:10:00			05/20/2019 10:15:00			05/20/2019 09:20:00			05/20/2019 09:25:00			05/20/2019 09:35:00			05/20/2019 09:30:00														
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil														
Analyte	Result			Q			MDL			Result			Q			MDL			Result			Q			MDL			Result			Q			MDL			Result			Q			MDL		
SEMIVOLATILES																																													
N-Nitrosodiphenylamine	mg/kg	NA	NA	0.0069	U	0.0069	0.007	U	0.007	0.0074	U	0.0074	0.0072	U	0.0072	0.007	U	0.007	0.0068	U	0.0068	0.0002	U	0.0002	0.0074	U	0.0074	0.0068	U	0.0068	0.0067	U	0.0067												
Pentachlorophenol	mg/kg	0.8	6.7	0.074	U	0.074	0.075	U	0.075	0.079	U	0.079	0.077	U	0.077	0.075	U	0.075	0.073	U	0.073	0.0016	U	0.0016	0.079	U	0.079	0.073	U	0.073	0.071	U	0.071												
Phenanthrene	mg/kg	100	100	0.0063	U	0.0063	0.0065	U	0.0065	0.65		0.0068	0.083	J	0.0066	1.6		0.0065	0.0063	U	0.0063	0.099		0.0001	0.43		0.0068	0.74		0.0062	0.0061	U	0.0061												
Phenol	mg/kg	0.33	100	0.0053	U	0.0053	0.0054	F1 F	0.0054	0.0057	U	0.0057	0.0056	U	0.0056	0.0054	U	0.0054	0.0053	U	0.0053	0.0003	J	0.0001	0.0057	U	0.0057	0.0053	U	0.0053	0.0052	U	0.0052												
Pyrene	mg/kg	100	100	0.0089	U	0.0089	0.0091	U	0.0091	0.99		0.0096	0.14	J	0.0094	2		0.0091	0.0089	U	0.0089	0.098		0.0002	0.8		0.0096	0.74		0.0088	0.0086	U	0.0086												

Notes:
 SB-14(3-3.5) - Sample ID(Sample Depth)
 mg/kg - milligrams per kilogram
 Q - Laboratory Qualifier
BOLD - Constituent detected above laboratory Minimum Detection Limit
 SCO - Soil Cleanup Objective
 Detected above the Unrestricted Use SCO
 Detected above the Restricted Residential SCO
 MDL - Minimum Detection Limit
 J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value
 U - Indicates the constituent was analyzed for but not detected
 * - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits
 B - Constituent was found in the laboratory blank and the sample
 F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits
 F2 - MS/MSD relative percent difference exceeds the control limits

Table 1B
 Summary of Soil/Fill Sampling Results
 Semi-Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-31 (1-1.5)			SB-31 (9-9.5)			SB-31 (11-11.5)			SB-31 (16.5-17)			SB-32 (4-4.5)			SB-32 (7-7.5)			SB-32 (14.5-15)			SB-32 (18-18.5)			SB-33 (3.5-4.0)			SB-33 (7.5-8.0)														
Lab Sample ID				460-182440-13			460-182440-14			460-182440-15			460-182440-16			460-182440-17			460-182440-18			460-182440-19			460-182440-20			460-182440-21			460-182440-22														
Sampling Date/Time				05/20/2019 09:40:00			05/20/2019 09:45:00			05/20/2019 09:50:00			05/20/2019 09:55:00			05/20/2019 10:20:00			05/20/2019 10:22:00			05/20/2019 10:25:00			05/20/2019 10:30:00			05/20/2019 10:35:00			05/20/2019 10:40:00														
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil														
Analyte	Result			Q			MDL			Result			Q			MDL			Result			Q			MDL			Result			Q			MDL			Result			Q			MDL		
SEMIVOLATILES																																													
N-Nitrosodiphenylamine	mg/kg	NA	NA	0.007	U	0.007	0.078	U	0.078	0.0068	U	0.0068	0.015	U	0.015	0.008	U	0.008	0.014	U	0.014	0.0069	U	0.0069	0.0068	U	0.0068	0.0067	U	0.0067	0.0065	U	0.0065												
Pentachlorophenol	mg/kg	0.8	6.7	0.075	U	0.075	0.84	U	0.84	0.072	U	0.072	0.16	U	0.16	0.086	U	0.086	0.15	U	0.15	0.074	U	0.074	0.073	U	0.073	0.072	F1 F	0.072	0.07	U	0.07												
Phenanthrene	mg/kg	100	100	0.11	J	0.0064	50		0.072	1.1		0.0062	9.8		0.013	1.8		0.0074	7.7		0.013	0.13	J	0.0063	0.57		0.0062	0.0062	U	0.0062	0.006	U	0.006												
Phenol	mg/kg	0.33	100	0.0054	U	0.0054	0.06	U	0.06	0.0052	U	0.0052	0.011	U	0.011	0.0062	U	0.0062	0.011	U	0.011	0.0053	U	0.0053	0.0053	U	0.0053	0.0052	U	0.0052	0.005	U	0.005												
Pyrene	mg/kg	100	100	0.13	J	0.0091	68		0.1	1.3		0.0088	14		0.019	3.1		0.01	9.8		0.019	0.18	J	0.009	0.64		0.0088	0.0088	U	0.0088	0.0085	U	0.0085												

Notes:
 SB-14(3-3.5) - Sample ID(Sample Depth)
 mg/kg - milligrams per kilogram
 Q - Laboratory Qualifier
BOLD - Constituent detected above laboratory Minimum Detection Limit
 SCO - Soil Cleanup Objective
 Detected above the Unrestricted Use SCO
 Detected above the Restricted Residential SCO
 MDL - Minimum Detection Limit
 J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value
 U - Indicates the constituent was analyzed for but not detected
 * - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits
 B - Constituent was found in the laboratory blank and the sample
 F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits
 F2 - MS/MSD relative percent difference exceeds the control limits

Table 1B
Summary of Soil/Fill Sampling Results
Semi-Volatile Organic Compounds
1510 Broadway, Brooklyn, NY

Sample ID	Lab Sample ID	Sampling Date/Time	Sample Matrix	Analyte	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-33 (11.5-12)			SB-33 (17.0-17.5)			SB-34 (1.5-2.0)			SB-34 (9-9.5)			SB-34 (13-13.5)			SB-34 (15.5-16.0)			SB-35 (4.5-5.0)			SB-35 (19-19.5)			SB-35 (8-8.5)			SB-35 (13.5-14.0)		
								Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
SEMIVOLATILES																																					
Atrazine	mg/kg	NA	NA	0.0088	U	0.0088	0.0087	U	0.0087	0.0094	U	0.0094	0.0087	U	0.0087	0.0092	U	0.0092	0.0088	U	0.0088	0.0097	U	0.0097	0.0086	U	0.0086	0.018	U	0.018	0.0087	U	0.0087				
Benzaldehyde	mg/kg	NA	NA	0.015	U	0.015	0.015	U	0.015	0.016	U	0.016	0.015	U	0.015	0.016	U	0.016	0.015	U	0.015	0.021	J	0.017	0.015	U	0.015	0.031	U	0.031	0.015	U	0.015				
Benzo[a]anthracene	mg/kg	1	1	0.012	U	0.012	0.012	U	0.012	0.33		0.013	0.012	U	0.012	0.013	U	0.013	0.012	U	0.012	0.43		0.013	0.012	U	0.012	5.1		0.025	0.012	U	0.012				
Benzo[a]pyrene	mg/kg	1	1	0.0093	U	0.0093	0.0092	U	0.0092	0.33		0.01	0.0091	U	0.0091	0.0097	U	0.0097	0.0093	U	0.0093	0.54		0.01	0.0091	U	0.0091	4.5		0.019	0.0092	U	0.0092				
Benzo[b]fluoranthene	mg/kg	1	1	0.009	U	0.009	0.023	J	0.0089	0.37		0.0097	0.0089	U	0.0089	0.0094	U	0.0094	0.009	U	0.009	0.7		0.01	0.0089	U	0.0089	6.4		0.018	0.0089	U	0.0089				
Benzo[g,h,i]perylene	mg/kg	100	100	0.01	U	0.01	0.01	U	0.01	0.22	J	0.011	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.79		0.011	0.01	U	0.01	2.7		0.021	0.01	U	0.01				
Benzo[k]fluoranthene	mg/kg	0.8	3.9	0.0069	U	0.0069	0.0067	U	0.0067	0.13		0.0073	0.0067	U	0.0067	0.0071	U	0.0071	0.0068	U	0.0068	0.26		0.0075	0.0067	U	0.0067	1.9		0.014	0.0067	U	0.0067				
Bis(2-chloroethoxy)methane	mg/kg	NA	NA	0.012	U	0.012	0.012	U	0.012	0.013	U	0.013	0.012	U	0.012	0.013	U	0.013	0.012	U	0.012	0.013	U	0.013	0.012	U	0.012	0.024	U	0.024	0.012	U	0.012				
Bis(2-chloroethyl)ether	mg/kg	NA	NA	0.0042	U	0.0042	0.0042	U	0.0042	0.0045	U	0.0045	0.0041	U	0.0041	0.0044	U	0.0044	0.0042	U	0.0042	0.0047	U	0.0047	0.0041	U	0.0041	0.0085	U	0.0085	0.0042	U	0.0042				
Bis(2-ethylhexyl) phthalate	mg/kg	NA	NA	0.018	U	0.018	0.018	U	0.018	0.02	U	0.02	0.018	U	0.018	0.019	U	0.019	0.018	U	0.018	0.28	J	0.02	0.018	U	0.018	0.037	U	0.037	0.018	U	0.018				
Butyl benzyl phthalate	mg/kg	NA	NA	0.016	U	0.016	0.016	U	0.016	0.018	U	0.018	0.016	U	0.016	0.017	U	0.017	0.016	U	0.016	0.018	U	0.018	0.016	U	0.016	0.033	U	0.033	0.016	U	0.016				
Caprolactam	mg/kg	NA	NA	0.021	U	0.021	0.021	U	0.021	0.022	U	0.022	0.021	U	0.021	0.022	U	0.022	0.021	U	0.021	0.023	U	0.023	0.021	U	0.021	0.042	U	0.042	0.021	U	0.021				
Carbazole	mg/kg	NA	NA	0.0041	U	0.0041	0.004	U	0.004	0.044	J	0.0044	0.004	U	0.004	0.0043	U	0.0043	0.0041	U	0.0041	0.069	J	0.0045	0.004	U	0.004	1		0.0083	0.004	U	0.004				
Chrysene	mg/kg	1	3.9	0.0059	U	0.0059	0.0058	U	0.0058	0.35	J	0.0063	0.0058	U	0.0058	0.0062	U	0.0062	0.0059	U	0.0059	0.44		0.0065	0.0058	U	0.0058	5.1		0.012	0.0058	U	0.0058				
Dibenz(a,h)anthracene	mg/kg	0.33	0.33	0.015	U	0.015	0.015	U	0.015	0.065		0.016	0.015	U	0.015	0.016	U	0.016	0.015	U	0.015	0.15		0.017	0.015	U	0.015	0.93		0.031	0.015	U	0.015				
Dibenzofuran	mg/kg	7	59	0.0049	U	0.0049	0.0048	U	0.0048	0.024	J	0.0053	0.0048	U	0.0048	0.0051	U	0.0051	0.0049	U	0.0049	0.025	J	0.0054	0.0048	U	0.0048	0.53	J	0.0099	0.0048	U	0.0048				
Diethyl phthalate	mg/kg	NA	NA	0.0051	U	0.0051	0.005	U	0.005	0.0054	U	0.0054	0.005	U	0.005	0.0053	U	0.0053	0.0051	U	0.0051	0.0056	U	0.0056	0.005	U	0.005	0.01	U	0.01	0.005	U	0.005				
Dimethyl phthalate	mg/kg	NA	NA	0.0042	U	0.0042	0.0041	U	0.0041	0.0045	U	0.0045	0.0041	U	0.0041	0.0044	U	0.0044	0.0042	U	0.0042	0.0046	U	0.0046	0.0041	U	0.0041	0.0085	U	0.0085	0.0041	U	0.0041				
Di-n-butyl phthalate	mg/kg	NA	NA	0.062	U	0.062	0.061	U	0.061	0.066	U	0.066	0.061	U	0.061	0.064	U	0.064	0.062	U	0.062	0.068	U	0.068	0.06	U	0.06	0.12	U	0.12	0.061	U	0.061				
Di-n-octyl phthalate	mg/kg	NA	NA	0.019	U	0.019	0.018	U	0.018	0.02	U	0.02	0.018	U	0.018	0.019	U	0.019	0.018	U	0.018	0.02	U	0.02	0.018	U	0.018	0.037	U	0.037	0.018	U	0.018				
Fluoranthene	mg/kg	100	100	0.0045	U	0.0045	0.0045	U	0.0045	0.59		0.0049	0.0045	U	0.0045	0.0047	U	0.0047	0.0045	U	0.0045	0.89		0.005	0.0045	U	0.0045	10		0.0092	0.0045	U	0.0045				
Fluorene	mg/kg	30	100	0.0047	U	0.0047	0.0047	U	0.0047	0.0051	U	0.0051	0.0047	U	0.0047	0.0049	U	0.0049	0.0047	U	0.0047	0.04	J	0.0052	0.0046	U	0.0046	0.94		0.0096	0.0047	U	0.0047				
Hexachlorobenzene	mg/kg	0.33	1.2	0.0051	U	0.0051	0.005	U	0.005	0.0055	U	0.0055	0.005	U	0.005	0.0053	U	0.0053	0.0051	U	0.0051	0.0056	U	0.0056	0.005	U	0.005	0.01	U	0.01	0.005	U	0.005				
Hexachlorobutadiene	mg/kg	NA	NA	0.0074	U	0.0074	0.0073	U	0.0073	0.008	U	0.008	0.0073	U	0.0073	0.0078	U	0.0078	0.0074	U	0.0074	0.0082	U	0.0082	0.0073	U	0.0073	0.015	U	0.015	0.0073	U	0.0073				
Hexachlorocyclopentadiene	mg/kg	NA	NA	0.031	U	0.031	0.03	U	0.03	0.033	U	0.033	0.03	U	0.03	0.032	U	0.032	0.031	U	0.031	0.034	U	0.034	0.03	U	0.03	0.062	U	0.062	0.03	U	0.03				
Hexachloroethane	mg/kg	NA	NA	0.0054	U	0.0054	0.0053	U	0.0053	0.0058	U	0.0058	0.0053	U	0.0053	0.0056	U	0.0056	0.0054	U	0.0054	0.0059	U	0.0059	0.0053	U	0.0053	0.011	U	0.011	0.0053	U	0.0053				
Indeno[1,2,3-cd]pyrene	mg/kg	0.5	0.5	0.014	U	0.014	0.013	U	0.013	0.23		0.015	0.013	U	0.013	0.014	U	0.014	0.014	U	0.014	0.62		0.015	0.013	U	0.013	3.2		0.028	0.013	U	0.013				
Isophorone	mg/kg	NA	NA	0.0092	U	0.0092	0.009	U	0.009	0.0099	U	0.0099	0.009	U	0.009	0.0096	U	0.0096	0.0092	U	0.0092	0.01	U	0.01	0.009	U	0.009	0.019	U	0.019	0.009	U	0.009				
Naphthalene	mg/kg	12	100	0.006	U	0.006	0.0059	U	0.0059	0.031	J	0.0065	0.0059	U	0.0059	0.0063	U	0.0063	0.006	U	0.006	0.038	J	0.0067	0.0059	U	0.0059	0.21	J	0.012	0.0059	U	0.0059				
Nitrobenzene	mg/kg	NA	NA	0.0084	U	0.0084	0.0083	U	0.0083	0.009	U	0.009	0.0082	U	0.0082	0.0087	U	0.0087	0.0084	U	0.0084	0.0092	U	0.0092	0.0082	U	0.0082	0.017	U	0.017	0.0082	U	0.0082				
N-Nitrosodi-n-propylamine	mg/kg	NA	NA	0.0056	U	0.0056	0.0055	U	0.0055	0.006	U	0.006	0.0055	U	0.0055	0.0058	U	0.0058	0.0056	U	0.0056	0.0061	U	0.0061	0.0055	U	0.0055	0.011	U	0.011	0.0055	U	0.0055				

Table 1B
Summary of Soil/Fill Sampling Results
Semi-Volatile Organic Compounds
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-33 (11.5-12)			SB-33 (17.0-17.5)			SB-34 (1.5-2.0)			SB-34 (9-9.5)			SB-34 (13-13.5)			SB-34 (15.5-16.0)			SB-35 (4.5-5.0)			SB-35 (19-19.5)			SB-35 (8-8.5)			SB-35 (13.5-14.0)		
Lab Sample ID				460-182440-23			460-182440-24			460-182440-25			460-182440-26			460-182440-27			460-182440-28			460-182440-29			460-182440-30			460-182440-31			460-182440-32		
Sampling Date/Time				05/20/2019 10:45:00			05/20/2019 10:50:00			05/20/2019 12:00:00			05/20/2019 12:05:00			05/20/2019 12:10:00			05/20/2019 12:15:00			05/20/2019 12:20:00			05/20/2019 12:35:00			05/20/2019 12:25:00			05/20/2019 12:30:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL			
SEMIVOLATILES																																	
N-Nitrosodiphenylamine	mg/kg	NA	NA	0.0067	U	0.0067	0.0066	U	0.0066	0.0072	U	0.0072	0.0066	U	0.0066	0.007	U	0.007	0.0067	U	0.0067	0.0074	U	0.0074	0.0066	U	0.0066	0.014	U	0.014	0.0066	U	0.0066
Pentachlorophenol	mg/kg	0.8	6.7	0.072	U	0.072	0.07	U	0.07	0.077	U	0.077	0.07	U	0.07	0.075	U	0.075	0.072	U	0.072	0.079	U	0.079	0.07	U	0.07	0.14	U	0.14	0.07	U	0.07
Phenanthrene	mg/kg	100	100	0.0061	U	0.0061	0.006	U	0.006	0.38		0.0066	0.006	U	0.006	0.0064	U	0.0064	0.0061	U	0.0061	0.52		0.0068	0.006	U	0.006	9.3		0.012	0.006	U	0.006
Phenol	mg/kg	0.33	100	0.0052	U	0.0052	0.0051	U	0.0051	0.0055	U	0.0055	0.0051	U	0.0051	0.0054	U	0.0054	0.0052	U	0.0052	0.0057	U	0.0057	0.0051	U	0.0051	0.01	U	0.01	0.0051	U	0.0051
Pyrene	mg/kg	100	100	0.0087	U	0.0087	0.0085	U	0.0085	0.59		0.0093	0.0085	U	0.0085	0.0091	U	0.0091	0.0087	U	0.0087	0.74		0.0096	0.0085	U	0.0085	9		0.018	0.0085	U	0.0085

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1B
 Summary of Soil/Fill Sampling Results
 Semi-Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-36 (2-2.5)			SB-36 (6-6.5)			SB-36 (13-13.5)			SB-36 (17-17.5)			TP-5(4.5-5.0)			TP-5(9.5-10.0)			TP-5(12-12.5)			TP-6(4.5-5.0)			TP-6(9-9.5)			TP-6(11-11.5)														
Lab Sample ID				460-182440-33			460-182440-34			460-182440-35			460-182440-36			460-182779-1			460-182779-2			460-182779-3			460-182779-4			460-182779-5			460-182779-6														
Sampling Date/Time				05/20/2019 12:40:00			05/20/2019 12:45:00			05/20/2019 12:50:00			05/20/2019 12:55:00			05/23/2019 12:20:00			05/23/2019 12:35:00			05/23/2019 12:45:00			05/23/2019 14:30:00			05/23/2019 14:35:00			05/23/2019 14:45:00														
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil																	
Analyte	Result			Q			MDL			Result			Q			MDL			Result			Q			MDL			Result			Q			MDL			Result			Q			MDL		
SEMIVOLATILES																																													
N-Nitrosodiphenylamine	mg/kg	NA	NA	0.0077	U	0.0077	0.0074	U	0.0074	0.0068	U	0.0068	0.0066	U	0.0066	0.0071	U	0.0071	0.0072	U	0.0072	0.0068	U F1	0.0068	0.064	U	0.064	0.0075	U	0.0075	0.0074	U	0.0074												
Pentachlorophenol	mg/kg	0.8	6.7	0.082	U	0.082	0.079	U	0.079	0.073	U	0.073	0.071	U	0.071	0.076	U	0.076	0.077	U	0.077	0.073	F1 F	0.073	0.68	U	0.68	0.08	U	0.08	0.08	U	0.08												
Phenanthrene	mg/kg	100	100	0.007	U	0.007	0.41		0.0068	5		0.0063	0.0061	U	0.0061	1.3		0.0065	4.5		0.0066	0.032	J F1	0.0063	36		0.059	1.3		0.0069	0.0068	U	0.0068												
Phenol	mg/kg	0.33	100	0.0059	U	0.0059	0.0057	U	0.0057	0.0053	U	0.0053	0.0051	U	0.0051	0.0055	U	0.0055	0.0056	U	0.0056	0.0053	U	0.0053	0.049	U	0.049	0.0058	U *	0.0058	0.0057	U *	0.0057												
Pyrene	mg/kg	100	100	0.046	J	0.0099	0.55		0.0096	4.6		0.0089	0.0086	U	0.0086	1.6		0.0093	5.2		0.0094	0.058	J	0.0089	47		0.083	2.3		0.0097	0.0096	U	0.0096												

Notes:
 SB-14(3-3.5) - Sample ID(Sample Depth)
 mg/kg - milligrams per kilogram
 Q - Laboratory Qualifier
BOLD - Constituent detected above laboratory Minimum Detection Limit
 SCO - Soil Cleanup Objective
 Detected above the Unrestricted Use SCO
 Detected above the Restricted Residential SCO
 MDL - Minimum Detection Limit
 J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value
 U - Indicates the constituent was analyzed for but not detected
 * - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits
 B - Constituent was found in the laboratory blank and the sample
 F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits
 F2 - MS/MSD relative percent difference exceeds the control limits

Table 1B
Summary of Soil/Fill Sampling Results
Semi-Volatile Organic Compounds
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	TP-7(4.5-5.0)			TP-7(8-8.5)			TP-7(10-10.5)			DUP-1			DUP-2			DUP-3			
Lab Sample ID				460-182779-7			460-182779-8			460-182779-9			460-182440-37			460-182616-9			460-182722-21			
Sampling Date/Time				05/23/2019 12:55:00			05/23/2019 13:05:00			05/23/2019 13:15:00			05/20/2019 00:00:00			05/21/2019 00:00:00			05/22/2019 00:00:00			
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
SEMIVOLATILES																						
1,1'-Biphenyl	mg/kg	NA	NA	0.03	J	0.005	0.032	U	0.032	0.071	J	0.0059	0.0046	U	0.0046	0.0048	U	0.0048	0.0051	U	0.0051	
1,2,4,5-Tetrachlorobenzene	mg/kg	NA	NA	0.0049	U	0.0049	0.031	U	0.031	0.0059	U	0.0059	0.0045	U	0.0045	0.0048	U	0.0048	0.005	U	0.005	
2,2'-oxybis[1-chloropropane]	mg/kg	NA	NA	0.0068	U	0.0068	0.043	U	0.043	0.0081	U	0.0081	0.0062	U	0.0062	0.0066	U	0.0066	0.0069	U	0.0069	
2,3,4,6-Tetrachlorophenol	mg/kg	NA	NA	0.025	U	0.025	0.16	U	0.16	0.03	U	0.03	0.023	U	0.023	0.025	U	0.025	0.026	U	0.026	
2,4,5-Trichlorophenol	mg/kg	NA	NA	0.012	U	0.012	0.079	U	0.079	0.015	U	0.015	0.011	U	0.011	0.012	U	0.012	0.013	U	0.013	
2,4,6-Trichlorophenol	mg/kg	NA	NA	0.019	U	0.019	0.12	U	0.12	0.023	U	0.023	0.017	U	0.017	0.018	U	0.018	0.019	U	0.019	
2,4-Dichlorophenol	mg/kg	NA	NA	0.0079	U*	0.0079	0.051	U*	0.051	0.0095	U*	0.0095	0.0073	U*	0.0073	0.0077	U	0.0077	0.008	U	0.008	
2,4-Dimethylphenol	mg/kg	NA	NA	0.017	U	0.017	0.11	U	0.11	0.02	U	0.02	0.015	U	0.015	0.016	U	0.016	0.017	U	0.017	
2,4-Dinitrophenol	mg/kg	NA	NA	0.18	U	0.18	1.2	U	1.2	0.22	U	0.22	0.17	U	0.17	0.18	U	0.18	0.19	U	0.19	
2,4-Dinitrotoluene	mg/kg	NA	NA	0.019	U	0.019	0.12	U	0.12	0.023	U	0.023	0.017	U	0.017	0.018	U	0.018	0.019	U	0.019	
2,6-Dinitrotoluene	mg/kg	NA	NA	0.012	U	0.012	0.078	U	0.078	0.015	U	0.015	0.011	U	0.011	0.012	U	0.012	0.012	U	0.012	
2-Chloronaphthalene	mg/kg	NA	NA	0.017	U	0.017	0.11	U	0.11	0.021	U	0.021	0.016	U	0.016	0.017	U	0.017	0.018	U	0.018	
2-Chlorophenol	mg/kg	NA	NA	0.0053	U*	0.0053	0.034	U*	0.034	0.0063	U*	0.0063	0.0048	U*	0.0048	0.0051	U	0.0051	0.0053	U	0.0053	
2-Methylnaphthalene	mg/kg	NA	NA	0.098	J	0.0047	0.41	J	0.03	0.27	J	0.0056	0.0043	U	0.0043	0.0045	U	0.0045	0.0048	U	0.0048	
2-Methylphenol	mg/kg	0.33	100	0.0061	U*	0.0061	0.039	U*	0.039	0.0072	U*	0.0072	0.0056	U	0.0056	0.0059	U	0.0059	0.0061	U	0.0061	
2-Nitroaniline	mg/kg	NA	NA	0.014	U	0.014	0.09	U	0.09	0.017	U	0.017	0.013	U	0.013	0.014	U	0.014	0.014	U	0.014	
2-Nitrophenol	mg/kg	NA	NA	0.012	U	0.012	0.077	U	0.077	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.012	U	0.012	
3,3'-Dichlorobenzidine	mg/kg	NA	NA	0.057	U	0.057	0.36	U	0.36	0.068	U	0.068	0.052	U	0.052	0.055	U	0.055	0.058	U	0.058	
3-Nitroaniline	mg/kg	NA	NA	0.02	U	0.02	0.13	U	0.13	0.024	U	0.024	0.019	U	0.019	0.02	U	0.02	0.021	U	0.021	
4,6-Dinitro-2-methylphenol	mg/kg	NA	NA	0.061	U	0.061	0.39	U	0.39	0.073	U	0.073	0.056	U	0.056	0.059	U	0.059	0.062	U*	0.062	
4-Bromophenyl phenyl ether	mg/kg	NA	NA	0.0049	U	0.0049	0.031	U	0.031	0.0058	U	0.0058	0.0045	U	0.0045	0.0047	U	0.0047	0.0049	U	0.0049	
4-Chloro-3-methylphenol	mg/kg	NA	NA	0.0062	U	0.0062	0.04	U	0.04	0.0074	U	0.0074	0.0057	U	0.0057	0.006	U	0.006	0.0063	U	0.0063	
4-Chloroaniline	mg/kg	NA	NA	0.026	U	0.026	0.17	U	0.17	0.031	U	0.031	0.024	U	0.024	0.025	U	0.025	0.027	U	0.027	
4-Chlorophenyl phenyl ether	mg/kg	NA	NA	0.0059	U	0.0059	0.038	U	0.038	0.0071	U	0.0071	0.0054	U	0.0054	0.0057	U	0.0057	0.006	U	0.006	
4-Methylphenol	mg/kg	0.33	100	0.01	J	0.0064	0.041	U	0.041	0.012	J	0.0076	0.0059	U	0.0059	0.0062	U	0.0062	0.0065	U	0.0065	
4-Nitroaniline	mg/kg	NA	NA	0.014	U	0.014	0.089	U	0.089	0.017	U	0.017	0.013	U	0.013	0.014	U	0.014	0.014	U	0.014	
4-Nitrophenol	mg/kg	NA	NA	0.061	U	0.061	0.39	U	0.39	0.073	U	0.073	0.056	U	0.056	0.059	U	0.059	0.062	U	0.062	
Acenaphthene	mg/kg	20	100	0.39		0.027	1.3	J	0.17	0.52		0.033	0.025	U	0.025	0.026	U	0.026	0.028	U	0.028	
Acenaphthylene	mg/kg	100	100	0.13	J	0.0039	0.32	J	0.025	0.2	J	0.0046	0.0036	U	0.0036	0.0038	U	0.0038	0.0039	U	0.0039	
Acetophenone	mg/kg	NA	NA	0.0061	U	0.0061	0.039	U	0.039	0.0072	U	0.0072	0.0056	U	0.0056	0.0059	U	0.0059	0.0061	U	0.0061	
Anthracene	mg/kg	100	100	0.97		0.0042	2.5		0.027	1.6		0.005	0.0039	U	0.0039	0.0041	U	0.0041	0.0043	U	0.0043	

Table 1B
Summary of Soil/Fill Sampling Results
Semi-Volatile Organic Compounds
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	TP-7(4.5-5.0)			TP-7(8-8.5)			TP-7(10-10.5)			DUP-1			DUP-2			DUP-3		
Lab Sample ID				460-182779-7			460-182779-8			460-182779-9			460-182440-37			460-182616-9			460-182722-21		
Sampling Date/Time				05/23/2019 12:55:00			05/23/2019 13:05:00			05/23/2019 13:15:00			05/20/2019 00:00:00			05/21/2019 00:00:00			05/22/2019 00:00:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
SEMIVOLATILES																					
Atrazine	mg/kg	NA	NA	0.0095	U	0.0095	0.061	U	0.061	0.011	U	0.011	0.0087	U	0.0087	0.0092	U	0.0092	0.0096	U	0.0096
Benzaldehyde	mg/kg	NA	NA	0.016	U	0.016	0.1	U	0.1	0.02	U	0.02	0.015	U	0.015	0.016	U	0.016	0.017	U	0.017
Benzo[a]anthracene	mg/kg	1	1	3.3		0.013	6.6		0.084	5.7		0.016	0.012	U	0.012	0.013	U	0.013	0.013	U	0.013
Benzo[a]pyrene	mg/kg	1	1	2.9		0.01	6		0.064	4.3		0.012	0.0092	U	0.0092	0.0097	U	0.0097	0.01	U	0.01
Benzo[b]fluoranthene	mg/kg	1	1	4.4		0.0097	7.8		0.062	6.5		0.012	0.0089	U	0.0089	0.0094	U	0.0094	0.0099	U	0.0099
Benzo[g,h,i]perylene	mg/kg	100	100	1.2		0.011	2.6		0.071	1.7		0.013	0.01	U	0.01	0.011	U	0.011	0.011	U	0.011
Benzo[k]fluoranthene	mg/kg	0.8	3.9	1.8		0.0074	3.1		0.047	2.1		0.0088	0.0068	U	0.0068	0.0071	U	0.0071	0.0075	U	0.0075
Bis(2-chloroethoxy)methane	mg/kg	NA	NA	0.013	U	0.013	0.082	U	0.082	0.015	U	0.015	0.012	U	0.012	0.012	U	0.012	0.013	U	0.013
Bis(2-chloroethyl)ether	mg/kg	NA	NA	0.0045	U	0.0045	0.029	U	0.029	0.0054	U	0.0054	0.0042	U	0.0042	0.0044	U	0.0044	0.0046	U*	0.0046
Bis(2-ethylhexyl) phthalate	mg/kg	NA	NA	0.02	U	0.02	0.13	U	0.13	0.07	J	0.024	0.018	U	0.018	0.019	U	0.019	0.02	U	0.02
Butyl benzyl phthalate	mg/kg	NA	NA	0.018	U	0.018	0.11	U	0.11	0.021	U	0.021	0.016	U	0.016	0.017	U	0.017	0.018	U	0.018
Caprolactam	mg/kg	NA	NA	0.022	U	0.022	0.14	U	0.14	0.027	U	0.027	0.021	U	0.021	0.022	U	0.022	0.023	U	0.023
Carbazole	mg/kg	NA	NA	0.44		0.0044	1.5	J	0.028	0.65		0.0052	0.004	U	0.004	0.0043	U	0.0043	0.0045	U	0.0045
Chrysene	mg/kg	1	3.9	3.2		0.0063	6.5		0.041	5.9		0.0076	0.0058	U	0.0058	0.0061	U	0.0061	0.0064	U	0.0064
Dibenz(a,h)anthracene	mg/kg	0.33	0.33	0.41		0.016	0.52		0.1	0.68		0.019	0.015	U	0.015	0.016	U	0.016	0.016	U	0.016
Dibenzofuran	mg/kg	7	59	0.22	J	0.0053	0.98	J	0.034	0.47		0.0063	0.0048	U	0.0048	0.0051	U	0.0051	0.0054	U	0.0054
Diethyl phthalate	mg/kg	NA	NA	0.0054	U	0.0054	0.035	U	0.035	0.0065	U	0.0065	0.005	U	0.005	0.0053	U	0.0053	0.0055	U	0.0055
Dimethyl phthalate	mg/kg	NA	NA	0.0045	U	0.0045	0.029	U	0.029	0.0054	U	0.0054	0.0042	U	0.0042	0.0044	U	0.0044	0.0046	U	0.0046
Di-n-butyl phthalate	mg/kg	NA	NA	0.066	U	0.066	0.42	U	0.42	0.079	U	0.079	0.061	U	0.061	0.064	U	0.064	0.067	U	0.067
Di-n-octyl phthalate	mg/kg	NA	NA	0.02	U	0.02	0.13	U	0.13	0.024	U	0.024	0.018	U	0.018	0.019	U	0.019	0.02	U	0.02
Fluoranthene	mg/kg	100	100	6.4		0.0049	15		0.031	9.8		0.0058	0.0045	U	0.0045	0.0047	U	0.0047	0.0049	U	0.0049
Fluorene	mg/kg	30	100	0.43		0.0051	1.3	J	0.033	0.67		0.0061	0.0047	U	0.0047	0.0049	U	0.0049	0.0052	U	0.0052
Hexachlorobenzene	mg/kg	0.33	1.2	0.0055	U	0.0055	0.035	U	0.035	0.0066	U	0.0066	0.0051	U	0.0051	0.0053	U	0.0053	0.0056	U	0.0056
Hexachlorobutadiene	mg/kg	NA	NA	0.008	U	0.008	0.051	U	0.051	0.0095	U	0.0095	0.0073	U	0.0073	0.0077	U	0.0077	0.0081	U	0.0081
Hexachlorocyclopentadiene	mg/kg	NA	NA	0.033	U	0.033	0.21	U	0.21	0.039	U	0.039	0.03	U	0.03	0.032	U	0.032	0.033	U*	0.033
Hexachloroethane	mg/kg	NA	NA	0.0058	U	0.0058	0.037	U	0.037	0.0069	U	0.0069	0.0053	U	0.0053	0.0056	U*	0.0056	0.0059	U	0.0059
Indeno[1,2,3-cd]pyrene	mg/kg	0.5	0.5	1.5		0.015	3.2		0.094	1.9		0.017	0.013	U	0.013	0.014	U	0.014	0.015	U	0.015
Isophorone	mg/kg	NA	NA	0.0099	U	0.0099	0.063	U	0.063	0.012	U	0.012	0.0091	U	0.0091	0.0096	U	0.0096	0.01	U	0.01
Naphthalene	mg/kg	12	100	0.14	J	0.0065	0.77	J	0.042	0.45		0.0077	0.006	U	0.006	0.0063	U	0.0063	0.0066	U	0.0066
Nitrobenzene	mg/kg	NA	NA	0.009	U	0.009	0.058	U	0.058	0.011	U	0.011	0.0083	U	0.0083	0.0087	U	0.0087	0.0091	U	0.0091
N-Nitrosodi-n-propylamine	mg/kg	NA	NA	0.006	U	0.006	0.038	U	0.038	0.0071	U	0.0071	0.0055	U	0.0055	0.0058	U	0.0058	0.0061	U	0.0061

Table 1B
 Summary of Soil/Fill Sampling Results
 Semi-Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID		Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	TP-7(4.5-5.0)			TP-7(8-8.5)			TP-7(10-10.5)			DUP-1			DUP-2			DUP-3		
Lab Sample ID				460-182779-7			460-182779-8			460-182779-9			460-182440-37			460-182616-9			460-182722-21		
Sampling Date/Time				05/23/2019 12:55:00			05/23/2019 13:05:00			05/23/2019 13:15:00			05/20/2019 00:00:00			05/21/2019 00:00:00			05/22/2019 00:00:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
SEMIVOLATILES																					
N-Nitrosodiphenylamine	mg/kg	NA	NA	0.023	J	0.0072	0.046	U	0.046	0.07	J	0.0086	0.0066	U	0.0066	0.007	U	0.007	0.0073	U	0.0073
Pentachlorophenol	mg/kg	0.8	6.7	0.077	U	0.077	0.49	U	0.49	0.092	U	0.092	0.071	U	0.071	0.075	U	0.075	0.078	U	0.078
Phenanthrene	mg/kg	100	100	4.3		0.0066	14		0.042	9		0.0079	0.0061	U	0.0061	0.0064	U	0.0064	0.0067	U	0.0067
Phenol	mg/kg	0.33	100	0.0056	U *	0.0056	0.036	U *	0.036	0.0066	U *	0.0066	0.0051	U	0.0051	0.0054	U	0.0054	0.0056	U	0.0056
Pyrene	mg/kg	100	100	5.6		0.0093	13		0.06	11		0.011	0.0086	U	0.0086	0.009	U	0.009	0.0095	U	0.0095

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1C
Summary of Soil/Fill Sampling Results
Pesticides
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-14(3-3.5)			SB-14(8-8.5)			SB-14(14.5-15)			SB-14(19-19.5)			SB-15(2-2.5)			SB-15(9-9.5)			SB-15(12.5-13)		
Lab Sample ID				460-182722-9			460-182722-10			460-182722-11			460-182722-12			460-182722-13			460-182722-14			460-182722-15		
Sampling Date/Time				05/22/2019 09:05:00			05/22/2019 09:15:00			05/22/2019 09:20:00			05/22/2019 09:25:00			05/22/2019 10:45:00			05/22/2019 10:50:00			05/22/2019 09:55:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
PESTICIDES																								
4,4'-DDD	mg/kg	0.0033	13	0.25		0.014	0.069		0.0017	0.0013	U	0.0013	0.0013	U	0.0013	0.0013	U	0.0013	0.0016	U	0.0016	0.0014	U	0.0014
4,4'-DDE	mg/kg	0.0033	8.9	0.16		0.0096	0.0012	U	0.0012	0.00087	U	0.00087	0.00088	U	0.00088	0.003	J p	0.00092	0.0011	U	0.0011	0.006	J p	0.00099
4,4'-DDT	mg/kg	0.0033	7.9	0.96		0.015	0.35		0.0019	0.0014	U	0.0014	0.0014	U	0.0014	0.015		0.0014	0.0017	U	0.0017	0.029		0.0015
Aldrin	mg/kg	0.005	0.097	0.012	U	0.012	0.0015	U	0.0015	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0014	U	0.0014	0.0013	U	0.0013
alpha-BHC	mg/kg	0.02	0.48	0.0082	U	0.0082	0.001	U	0.001	0.00075	U	0.00075	0.00076	U	0.00076	0.00079	U	0.00079	0.00094	U	0.00094	0.00085	U	0.00085
beta-BHC	mg/kg	0.036	0.36	0.0091	U	0.0091	0.0011	U	0.0011	0.00082	U	0.00082	0.00084	U	0.00084	0.00087	U	0.00087	0.001	U	0.001	0.00094	U	0.00094
Chlordane (n.o.s.)	mg/kg	NA	NA	0.2	U	0.2	0.21		0.025	0.018	U	0.018	0.018	U	0.018	0.019	U	0.019	0.022	U	0.022	0.02	U	0.02
Chlordane (technical)	mg/kg	NA	NA	0.2	U	0.2	0.21		0.025	0.018	U	0.018	0.018	U	0.018	0.019	U	0.019	0.022	U	0.022	0.02	U	0.02
delta-BHC	mg/kg	0.04	100	0.005	U	0.005	0.00063	U	0.00063	0.00045	U	0.00045	0.00046	U	0.00046	0.00048	U	0.00048	0.00057	U	0.00057	0.00051	U	0.00051
Dieldrin	mg/kg	0.005	0.2	0.074		0.011	0.029		0.0013	0.00096	U	0.00096	0.00097	U	0.00097	0.001	U	0.001	0.0012	U	0.0012	0.0044		0.0011
Endosulfan I	mg/kg	2.4	24	0.012	U	0.012	0.0016	U	0.0016	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0014	U	0.0014	0.0013	U	0.0013
Endosulfan II	mg/kg	2.4	24	0.021	U	0.021	0.0026	U	0.0026	0.0019	U	0.0019	0.0019	U	0.0019	0.002	U	0.002	0.0024	U	0.0024	0.0022	U	0.0022
Endosulfan sulfate	mg/kg	2.4	24	0.01	U	0.01	0.0013	U	0.0013	0.00092	U	0.00092	0.00094	U	0.00094	0.00098	U	0.00098	0.0012	U	0.0012	0.0011	U	0.0011
Endosulfan, Total	mg/kg	NA	NA	0.012	U	0.012	0.0016	U	0.0016	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0014	U	0.0014	0.0013	U	0.0013
Endrin	mg/kg	0.014	11	0.012	U	0.012	0.0015	U	0.0015	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0013	U	0.0013	0.0012	U	0.0012
Endrin aldehyde	mg/kg	NA	NA	0.019	U	0.019	0.0024	U	0.0024	0.0017	U	0.0017	0.0018	U	0.0018	0.0018	U	0.0018	0.0022	U	0.0022	0.002	U	0.002
Endrin ketone	mg/kg	NA	NA	0.016	U	0.016	0.002	U	0.002	0.0014	U	0.0014	0.0015	U	0.0015	0.0015	U	0.0015	0.0018	U	0.0018	0.0016	U	0.0016
gamma-BHC (Lindane)	mg/kg	0.1	1.3	0.0075	U	0.0075	0.00095	U	0.00095	0.00068	U	0.00068	0.00069	U	0.00069	0.00072	U	0.00072	0.00086	U	0.00086	0.00078	U	0.00078
Heptachlor	mg/kg	0.042	2.1	0.0096	U	0.0096	0.0012	U	0.0012	0.00087	U	0.00087	0.00088	U	0.00088	0.00092	U	0.00092	0.0011	U	0.0011	0.00099	U	0.00099
Heptachlor epoxide	mg/kg	NA	NA	0.012	U	0.012	0.0015	U	0.0015	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0014	U	0.0014	0.0013	U	0.0013
Methoxychlor	mg/kg	NA	NA	0.019	U	0.019	0.0023	U	0.0023	0.0017	U	0.0017	0.0017	U	0.0017	0.0018	U	0.0018	0.0021	U	0.0021	0.0019	U	0.0019
Toxaphene	mg/kg	NA	NA	0.29	U	0.29	0.037	U	0.037	0.027	U	0.027	0.027	U	0.027	0.028	U	0.028	0.033	U	0.033	0.03	U	0.03

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1C
Summary of Soil/Fill Sampling Results
Pesticides
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-15(18-18.5)			SB-16(4-4.5)			SB-16(9.5-10)			SB-16(11.5-12)			SB-16(16-16.5)			SB-19(2-2.5)			SB-19(6-6.5)		
Lab Sample ID				460-182722-16	460-182722-5	460-182722-6	460-182722-7	460-182722-8	460-182722-1	460-182722-2														
Sampling Date/Time				05/22/2019 11:00:00	05/22/2019 08:15:00	05/22/2019 08:20:00	05/22/2019 08:30:00	05/22/2019 08:35:00	05/22/2019 07:55:00	05/22/2019 08:00:00														
Sample Matrix				Soil	Soil	Soil	Soil	Soil	Soil	Soil														
Analyte				Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
PESTICIDES																								
4,4'-DDD	mg/kg	0.0033	13	0.0013	U	0.0013	0.0013	U	0.0013	0.0014	U	0.0014	0.0013	U	0.0013	0.0015	U	0.0015	0.0013	U	0.0013	0.0013	U	0.0013
4,4'-DDE	mg/kg	0.0033	8.9	0.0009	U	0.0009	0.00093	U	0.00093	0.00097	U	0.00097	0.014	p	0.00092	0.0084	J p	0.001	0.00091	U	0.00091	0.00092	U	0.00092
4,4'-DDT	mg/kg	0.0033	7.9	0.0014	U	0.0014	0.0014	U	0.0014	0.0031	J	0.0015	0.061		0.0014	0.039		0.0016	0.003	J F1	0.0014	0.0014	U	0.0014
Aldrin	mg/kg	0.005	0.097	0.0011	U	0.0011	0.0012	U	0.0012	0.0012	U	0.0012	0.0012	U	0.0012	0.0013	U	0.0013	0.0012	U	0.0012	0.0012	U	0.0012
alpha-BHC	mg/kg	0.02	0.48	0.00077	U	0.00077	0.0008	U	0.0008	0.00084	U	0.00084	0.00079	U	0.00079	0.00087	U	0.00087	0.00078	U	0.00078	0.00079	U	0.00079
beta-BHC	mg/kg	0.036	0.36	0.00085	U	0.00085	0.00088	U	0.00088	0.00093	U	0.00093	0.00087	U	0.00087	0.00095	U	0.00095	0.00086	U	0.00086	0.00087	U	0.00087
Chlordane (n.o.s.)	mg/kg	NA	NA	0.018	U	0.018	0.019	U	0.019	0.02	U	0.02	0.019	U	0.019	0.11		0.021	0.019	U	0.019	0.019	U	0.019
Chlordane (technical)	mg/kg	NA	NA	0.018	U	0.018	0.019	U	0.019	0.02	U	0.02	0.019	U	0.019	0.021	U	0.021	0.019	U	0.019	0.019	U	0.019
delta-BHC	mg/kg	0.04	100	0.00047	U	0.00047	0.00048	U	0.00048	0.00051	U	0.00051	0.00047	U	0.00047	0.00052	U	0.00052	0.00047	U	0.00047	0.00048	U	0.00048
Dieldrin	mg/kg	0.005	0.2	0.00099	U	0.00099	0.001	U	0.001	0.0011	U	0.0011	0.001	U	0.001	0.0011	U	0.0011	0.001	U	0.001	0.001	U	0.001
Endosulfan I	mg/kg	2.4	24	0.0012	U	0.0012	0.0012	U	0.0012	0.0013	U	0.0013	0.0012	U	0.0012	0.0013	U	0.0013	0.0012	U	0.0012	0.0012	U	0.0012
Endosulfan II	mg/kg	2.4	24	0.002	U	0.002	0.002	U	0.002	0.0021	U	0.0021	0.002	U	0.002	0.0022	U	0.0022	0.002	U F1	0.002	0.002	U	0.002
Endosulfan sulfate	mg/kg	2.4	24	0.00095	U	0.00095	0.00099	U	0.00099	0.001	U	0.001	0.00097	U	0.00097	0.0011	U	0.0011	0.00097	U F1	0.00097	0.00098	U	0.00098
Endosulfan, Total	mg/kg	NA	NA	0.0012	U	0.0012	0.0012	U	0.0012	0.0013	U	0.0013	0.0012	U	0.0012	0.0013	U	0.0013	0.0012	U F1	0.0012	0.0012	U	0.0012
Endrin	mg/kg	0.014	11	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0011	U	0.0011	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011
Endrin aldehyde	mg/kg	NA	NA	0.0018	U	0.0018	0.0019	U	0.0019	0.0019	U	0.0019	0.0018	U	0.0018	0.002	U	0.002	0.0018	F1 F	0.0018	0.0018	U	0.0018
Endrin ketone	mg/kg	NA	NA	0.0015	U	0.0015	0.0015	U	0.0015	0.0016	U	0.0016	0.0015	U	0.0015	0.0017	U	0.0017	0.0015	U F1	0.0015	0.0015	U	0.0015
gamma-BHC (Lindane)	mg/kg	0.1	1.3	0.0007	U	0.0007	0.00073	U	0.00073	0.00077	U	0.00077	0.00072	U	0.00072	0.00079	U	0.00079	0.00071	U	0.00071	0.00072	U	0.00072
Heptachlor	mg/kg	0.042	2.1	0.0009	U	0.0009	0.00093	U	0.00093	0.00097	U	0.00097	0.00092	U	0.00092	0.001	U	0.001	0.00091	U	0.00091	0.00092	U	0.00092
Heptachlor epoxide	mg/kg	NA	NA	0.0011	U	0.0011	0.0012	U	0.0012	0.0012	U	0.0012	0.0012	U	0.0012	0.0013	U	0.0013	0.0012	U F1	0.0012	0.0012	U	0.0012
Methoxychlor	mg/kg	NA	NA	0.0017	U	0.0017	0.0018	U	0.0018	0.0019	U	0.0019	0.0018	U	0.0018	0.0019	U	0.0019	0.0018	U	0.0018	0.0018	U	0.0018
Toxaphene	mg/kg	NA	NA	0.027	U	0.027	0.029	U	0.029	0.03	U	0.03	0.028	U	0.028	0.031	U	0.031	0.028	U	0.028	0.028	U	0.028

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

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Table 1C
Summary of Soil/Fill Sampling Results
Pesticides
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-19(13.5-14)			SB-19(17-17.5)			SB-20(4.5-5)			SB-20(6.5-7)			SB-20(10.5-11)			SB-20(16-16.5)			SB-21 (1-1.5)		
Lab Sample ID				460-182722-3	460-182722-4	460-182722-17	460-182722-18	460-182722-19	460-182722-20	460-182616-1														
Sampling Date/Time				05/22/2019 08:05:00	05/22/2019 08:10:00	05/22/2019 11:15:00	05/22/2019 11:20:00	05/22/2019 11:25:00	05/22/2019 11:30:00	05/21/2019 13:00:00														
Sample Matrix				Soil	Soil	Soil	Soil	Soil	Soil	Soil														
Analyte				Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
PESTICIDES																								
4,4'-DDD	mg/kg	0.0033	13	0.0013	U	0.0013	0.0013	U	0.0013	0.027		0.0013	0.012		0.0015	0.0012	U	0.0012	0.0012	U	0.0012	0.0014	U	0.0014
4,4'-DDE	mg/kg	0.0033	8.9	0.0009	U	0.0009	0.00093	U	0.00093	0.0064	J p	0.00087	0.052		0.001	0.0048	J p	0.00084	0.00081	U	0.00081	0.00094	U	0.00094
4,4'-DDT	mg/kg	0.0033	7.9	0.0014	U	0.0014	0.0061	J	0.0014	0.035		0.0014	0.28		0.0016	0.027		0.0013	0.014		0.0013	0.0015	U	0.0015
Aldrin	mg/kg	0.005	0.097	0.0011	U	0.0011	0.0012	U	0.0012	0.0011	U	0.0011	0.0013	U	0.0013	0.0011	U	0.0011	0.001	U	0.001	0.0012	U	0.0012
alpha-BHC	mg/kg	0.02	0.48	0.00077	U	0.00077	0.0008	U	0.0008	0.00075	U	0.00075	0.00089	U	0.00089	0.00072	U	0.00072	0.0007	U	0.0007	0.00081	U	0.00081
beta-BHC	mg/kg	0.036	0.36	0.00085	U	0.00085	0.00088	U	0.00088	0.00083	U	0.00083	0.00098	U	0.00098	0.0008	U	0.0008	0.00077	U	0.00077	0.00089	U	0.00089
Chlordane (n.o.s.)	mg/kg	NA	NA	0.018	U	0.018	0.019	U	0.019	0.018	U	0.018	0.22		0.021	0.017	U	0.017	0.017	U	0.017	0.019	U	0.019
Chlordane (technical)	mg/kg	NA	NA	0.018	U	0.018	0.019	U	0.019	0.018	U	0.018	0.22		0.021	0.017	U	0.017	0.017	U	0.017	0.019	U	0.019
delta-BHC	mg/kg	0.04	100	0.00047	U	0.00047	0.00048	U	0.00048	0.00045	U	0.00045	0.00053	U	0.00053	0.00044	U	0.00044	0.00042	U	0.00042	0.00049	U	0.00049
Dieldrin	mg/kg	0.005	0.2	0.00099	U	0.00099	0.001	U	0.001	0.00096	U	0.00096	0.043		0.0011	0.0031		0.00093	0.0052		0.0009	0.001	U	0.001
Endosulfan I	mg/kg	2.4	24	0.0012	U	0.0012	0.0012	U	0.0012	0.0011	U	0.0011	0.0013	U	0.0013	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012
Endosulfan II	mg/kg	2.4	24	0.002	U	0.002	0.002	U	0.002	0.0019	U	0.0019	0.0022	U	0.0022	0.0018	U	0.0018	0.0018	U	0.0018	0.002	U	0.002
Endosulfan sulfate	mg/kg	2.4	24	0.00095	U	0.00095	0.00099	U	0.00099	0.00093	U	0.00093	0.0011	U	0.0011	0.00089	U	0.00089	0.00087	U	0.00087	0.001	U	0.001
Endosulfan, Total	mg/kg	NA	NA	0.0012	U	0.0012	0.0012	U	0.0012	0.0011	U	0.0011	0.0013	U	0.0013	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012
Endrin	mg/kg	0.014	11	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0013	U	0.0013	0.001	U	0.001	0.00099	U	0.00099	0.0011	U	0.0011
Endrin aldehyde	mg/kg	NA	NA	0.0018	U	0.0018	0.0019	U	0.0019	0.0017	U	0.0017	0.0021	U	0.0021	0.0017	U	0.0017	0.0016	U	0.0016	0.0019	U	0.0019
Endrin ketone	mg/kg	NA	NA	0.0015	U	0.0015	0.0015	U	0.0015	0.0014	U	0.0014	0.0017	U	0.0017	0.0014	U	0.0014	0.0013	U	0.0013	0.0015	U	0.0015
gamma-BHC (Lindane)	mg/kg	0.1	1.3	0.0007	U	0.0007	0.00073	U	0.00073	0.00069	U	0.00069	0.00081	U	0.00081	0.00066	U	0.00066	0.00064	U	0.00064	0.00074	U	0.00074
Heptachlor	mg/kg	0.042	2.1	0.0009	U	0.0009	0.00093	U	0.00093	0.00087	U	0.00087	0.001	U	0.001	0.00084	U	0.00084	0.00081	U	0.00081	0.00094	U	0.00094
Heptachlor epoxide	mg/kg	NA	NA	0.0011	U	0.0011	0.0012	U	0.0012	0.0011	U	0.0011	0.0013	U	0.0013	0.0011	U	0.0011	0.001	U	0.001	0.0012	U	0.0012
Methoxychlor	mg/kg	NA	NA	0.0017	U	0.0017	0.0018	U	0.0018	0.0017	U	0.0017	0.002	U	0.002	0.0016	U	0.0016	0.0016	U	0.0016	0.0018	U	0.0018
Toxaphene	mg/kg	NA	NA	0.028	U	0.028	0.028	U	0.028	0.027	U	0.027	0.032	U	0.032	0.026	U	0.026	0.025	U	0.025	0.029	U	0.029

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

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BOLD - Constituent detected above laboratory Minimum Detection

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Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

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Table 1C
 Summary of Soil/Fill Sampling Results
 Pesticides
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-21 (7-7.5)			SB-21 (12.5-13)			SB-21 (18-18.5)			SB-22 (3.5-4)			SB-22 (6-6.5)			SB-22 (14-14.5)			SB-22 (16.5-17)		
Lab Sample ID				460-182616-2			460-182616-3			460-182616-4			460-182616-5			460-182616-6			460-182616-7			460-182616-8		
Sampling Date/Time				05/21/2019 13:10:00			05/21/2019 13:20:00			05/21/2019 13:30:00			05/21/2019 13:45:00			05/21/2019 13:50:00			05/21/2019 14:00:00			05/21/2019 14:05:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil					
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
PESTICIDES																								
4,4'-DDD	mg/kg	0.0033	13	0.0013	U	0.0013	0.0013	U	0.0013	0.0012	U	0.0012	0.0079	J	0.0014	0.0013	U	0.0013	0.0013	U	0.0013	0.0012	U	0.0012
4,4'-DDE	mg/kg	0.0033	8.9	0.00087	U	0.00087	0.00087	U	0.00087	0.00086	U	0.00086	0.023	p	0.00096	0.00092	U	0.00092	0.00088	U	0.00088	0.00084	U	0.00084
4,4'-DDT	mg/kg	0.0033	7.9	0.0014	U	0.0014	0.0014	U	0.0014	0.0013	U	0.0013	0.12		0.0015	0.0014	U	0.0014	0.0014	U	0.0014	0.0013	U	0.0013
Aldrin	mg/kg	0.005	0.097	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011
alpha-BHC	mg/kg	0.02	0.48	0.00075	U	0.00075	0.00075	U	0.00075	0.00074	U	0.00074	0.00083	U	0.00083	0.00079	U	0.00079	0.00076	U	0.00076	0.00072	U	0.00072
beta-BHC	mg/kg	0.036	0.36	0.00083	U	0.00083	0.00083	U	0.00083	0.00082	U	0.00082	0.00091	U	0.00091	0.00087	U	0.00087	0.00083	U	0.00083	0.0008	U	0.0008
Chlordane (n.o.s.)	mg/kg	NA	NA	0.018	U	0.018	0.018	U	0.018	0.018	U	0.018	0.02	U	0.02	0.019	U	0.019	0.018	U	0.018	0.017	U	0.017
Chlordane (technical)	mg/kg	NA	NA	0.018	U	0.018	0.018	U	0.018	0.018	U	0.018	0.02	U	0.02	0.019	U	0.019	0.018	U	0.018	0.017	U	0.017
delta-BHC	mg/kg	0.04	100	0.00045	U	0.00045	0.00045	U	0.00045	0.00045	U	0.00045	0.0005	U	0.0005	0.00048	U	0.00048	0.00046	U	0.00046	0.00044	U	0.00044
Dieldrin	mg/kg	0.005	0.2	0.00096	U	0.00096	0.00096	U	0.00096	0.00095	U	0.00095	0.015		0.0011	0.001	U	0.001	0.00097	U	0.00097	0.00093	U	0.00093
Endosulfan I	mg/kg	2.4	24	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011
Endosulfan II	mg/kg	2.4	24	0.0019	U	0.0019	0.0019	U	0.0019	0.0019	U	0.0019	0.0021	U	0.0021	0.002	U	0.002	0.0019	U	0.0019	0.0018	U	0.0018
Endosulfan sulfate	mg/kg	2.4	24	0.00093	U	0.00093	0.00093	U	0.00093	0.00091	U	0.00091	0.001	U	0.001	0.00097	U	0.00097	0.00093	U	0.00093	0.00089	U	0.00089
Endosulfan, Total	mg/kg	NA	NA	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011
Endrin	mg/kg	0.014	11	0.0011	U	0.0011	0.0011	U	0.0011	0.001	U	0.001	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011	0.001	U	0.001
Endrin aldehyde	mg/kg	NA	NA	0.0017	U	0.0017	0.0017	U	0.0017	0.0017	U	0.0017	0.0019	U	0.0019	0.0018	U	0.0018	0.0018	U	0.0018	0.0017	U	0.0017
Endrin ketone	mg/kg	NA	NA	0.0014	U	0.0014	0.0014	U	0.0014	0.0014	U	0.0014	0.0016	U	0.0016	0.0015	U	0.0015	0.0014	U	0.0014	0.0014	U	0.0014
gamma-BHC (Lindane)	mg/kg	0.1	1.3	0.00068	U	0.00068	0.00069	U	0.00069	0.00068	U	0.00068	0.00075	U	0.00075	0.00072	U	0.00072	0.00069	U	0.00069	0.00066	U	0.00066
Heptachlor	mg/kg	0.042	2.1	0.00087	U	0.00087	0.00087	U	0.00087	0.00086	U	0.00086	0.00096	U	0.00096	0.00092	U	0.00092	0.00088	U	0.00088	0.00084	U	0.00084
Heptachlor epoxide	mg/kg	NA	NA	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011
Methoxychlor	mg/kg	NA	NA	0.0017	U	0.0017	0.0017	U	0.0017	0.0017	U	0.0017	0.0019	U	0.0019	0.0018	U	0.0018	0.0017	U	0.0017	0.0016	U	0.0016
Toxaphene	mg/kg	NA	NA	0.027	U	0.027	0.027	U	0.027	0.026	U	0.026	0.029	U	0.029	0.028	U	0.028	0.027	U	0.027	0.026	U	0.026

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1C
 Summary of Soil/Fill Sampling Results
 Pesticides
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-23 (4-4.5)			SB-23 (6.5-7)			SB-23 (12.5-13.0)			SB-23 (19-19.5)			SB-29 (3-3.5)			SB-29 (7-7.5)			SB-29 (14.5-15)		
Lab Sample ID				460-182440-1			460-182440-2			460-182440-3			460-182440-4			460-182440-5			460-182440-6			460-182440-7		
Sampling Date/Time				05/20/2019 09:00:00			05/20/2019 09:05:00			05/20/2019 09:10:00			05/20/2019 09:15:00			05/20/2019 10:00:00			05/20/2019 10:05:00			05/20/2019 10:10:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil					
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
PESTICIDES																								
4,4'-DDD	mg/kg	0.0033	13	0.017		0.0012	0.042	*	0.003	0.0012	U	0.0012	0.0013	U	0.0013	0.0093		0.0013	0.0013	U	0.0013	0.0013	U	0.0013
4,4'-DDE	mg/kg	0.0033	8.9	0.021		0.0008	0.18		0.0021	0.00086	U	0.00086	0.00088	U	0.00088	0.00092	U	0.00092	0.0009	U	0.0009	0.00088	U	0.00088
4,4'-DDT	mg/kg	0.0033	7.9	0.04		0.0012	0.71		0.0033	0.0013	U	0.0013	0.0014	U	0.0014	0.048		0.0014	0.0079		0.0014	0.023		0.0014
Aldrin	mg/kg	0.005	0.097	0.001	U	0.001	0.0027	U	0.0027	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011
alpha-BHC	mg/kg	0.02	0.48	0.00069	U	0.00069	0.0018	U	0.0018	0.00074	U	0.00074	0.00076	U	0.00076	0.00079	U	0.00079	0.00077	U	0.00077	0.00076	U	0.00076
beta-BHC	mg/kg	0.036	0.36	0.00076	U	0.00076	0.002	U	0.002	0.00081	U	0.00081	0.0033		0.00083	0.00087	U	0.00087	0.00085	U	0.00085	0.00083	U	0.00083
Chlordane (n.o.s.)	mg/kg	NA	NA	0.016	U	0.016	0.23		0.043	0.018	U	0.018	0.018	U	0.018	0.019	U	0.019	0.018	U	0.018	0.018	U	0.018
Chlordane (technical)	mg/kg	NA	NA	0.016	U	0.016	0.23		0.043	0.018	U	0.018	0.018	U	0.018	0.019	U	0.019	0.018	U	0.018	0.018	U	0.018
delta-BHC	mg/kg	0.04	100	0.00041	U	0.00041	0.0011	U	0.0011	0.00044	U	0.00044	0.0042		0.00046	0.00048	U	0.00048	0.00047	U	0.00047	0.00046	U	0.00046
Dieldrin	mg/kg	0.005	0.2	0.0044		0.00088	0.06		0.0023	0.00094	U	0.00094	0.00097	U	0.00097	0.0065		0.001	0.00099	U	0.00099	0.0036		0.00097
Endosulfan I	mg/kg	2.4	24	0.001	U	0.001	0.0027	U	0.0027	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0012	U	0.0012	0.0011	U	0.0011
Endosulfan II	mg/kg	2.4	24	0.0017	U	0.0017	0.0046	U	0.0046	0.0019	U	0.0019	0.0019	U	0.0019	0.002	U	0.002	0.002	U	0.002	0.0019	U	0.0019
Endosulfan sulfate	mg/kg	2.4	24	0.00085	U	0.00085	0.0022	U	0.0022	0.00091	U	0.00091	0.0028	J F1	0.00093	0.00098	U	0.00098	0.00095	U	0.00095	0.00093	U	0.00093
Endosulfan, Total	mg/kg	NA	NA	0.001	U	0.001	0.0027	U	0.0027	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0012	U	0.0012	0.0011	U	0.0011
Endrin	mg/kg	0.014	11	0.00097	U	0.00097	0.0026	U	0.0026	0.001	U	0.001	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011
Endrin aldehyde	mg/kg	NA	NA	0.0016	U	0.0016	0.0042	U	0.0042	0.0017	U	0.0017	0.0018	U F1	0.0018	0.0018	U	0.0018	0.0018	U	0.0018	0.0018	U	0.0018
Endrin ketone	mg/kg	NA	NA	0.0013	U	0.0013	0.0035	U	0.0035	0.0014	U	0.0014	0.0014	U	0.0014	0.0015	U	0.0015	0.0015	U	0.0015	0.0014	U	0.0014
gamma-BHC (Lindane)	mg/kg	0.1	1.3	0.00063	U	0.00063	0.0017	U	0.0017	0.00067	U	0.00067	0.00069	U	0.00069	0.00072	U	0.00072	0.0007	U	0.0007	0.00069	U	0.00069
Heptachlor	mg/kg	0.042	2.1	0.0008	U	0.0008	0.0021	U	0.0021	0.00086	U	0.00086	0.00088	U	0.00088	0.00092	U	0.00092	0.0009	U	0.0009	0.00088	U	0.00088
Heptachlor epoxide	mg/kg	NA	NA	0.001	U	0.001	0.0027	U	0.0027	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011
Methoxychlor	mg/kg	NA	NA	0.0015	U	0.0015	0.0041	U	0.0041	0.0017	U	0.0017	0.0017	U	0.0017	0.0018	U	0.0018	0.0017	U	0.0017	0.0017	U	0.0017
Toxaphene	mg/kg	NA	NA	0.024	U	0.024	0.064	U	0.064	0.026	U	0.026	0.027	U	0.027	0.028	U	0.028	0.028	U	0.028	0.027	U	0.027

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

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B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

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Table 1C
 Summary of Soil/Fill Sampling Results
 Pesticides
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-29 (18-18.5)			SB-30 (2-2.5)			SB-30 (8.5-9.0)			SB-30 (16.5-17.0)			SB-30 (13-13.5)			SB-31 (1-1.5)			SB-31 (9-9.5)		
Lab Sample ID				460-182440-8	460-182440-9	460-182440-10	460-182440-11	460-182440-12	460-182440-13	460-182440-14														
Sampling Date/Time				05/20/2019 10:15:00	05/20/2019 09:20:00	05/20/2019 09:25:00	05/20/2019 09:35:00	05/20/2019 09:30:00	05/20/2019 09:40:00	05/20/2019 09:45:00														
Sample Matrix				Soil	Soil	Soil	Soil	Soil	Soil	Soil														
Analyte				Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
PESTICIDES																								
4,4'-DDD	mg/kg	0.0033	13	0.0012	U	0.0012	0.0026	J p	0.0013	0.0013	U	0.0013	0.0012	U	0.0012	0.0012	U	0.0012	0.0041	J	0.0013	0.054		0.0014
4,4'-DDE	mg/kg	0.0033	8.9	0.00085	U	0.00085	0.00092	U	0.00092	0.00092	U	0.00092	0.00085	U	0.00085	0.00083	U	0.00083	0.00087	U	0.00087	0.00097	U	0.00097
4,4'-DDT	mg/kg	0.0033	7.9	0.0013	U	0.0013	0.029	p	0.0014	0.021		0.0014	0.007	J	0.0013	0.0049	J	0.0013	0.0014	U	0.0014	0.28	p	0.0015
Aldrin	mg/kg	0.005	0.097	0.0011	U	0.0011	0.0012	U	0.0012	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012
alpha-BHC	mg/kg	0.02	0.48	0.00073	U	0.00073	0.00079	U	0.00079	0.00079	U	0.00079	0.00073	U	0.00073	0.00072	U	0.00072	0.00075	U	0.00075	0.00084	U	0.00084
beta-BHC	mg/kg	0.036	0.36	0.00081	U	0.00081	0.00087	U	0.00087	0.00088	U	0.00088	0.0008	U	0.0008	0.00079	U	0.00079	0.00083	U	0.00083	0.00093	U	0.00093
Chlordane (n.o.s.)	mg/kg	NA	NA	0.017	U	0.017	0.019	U	0.019	0.019	U	0.019	0.017	U	0.017	0.017	U	0.017	0.018	U	0.018	0.02	U	0.02
Chlordane (technical)	mg/kg	NA	NA	0.017	U	0.017	0.019	U	0.019	0.019	U	0.019	0.017	U	0.017	0.017	U	0.017	0.018	U	0.018	0.02	U	0.02
delta-BHC	mg/kg	0.04	100	0.00044	U	0.00044	0.00048	U	0.00048	0.00048	U	0.00048	0.00044	U	0.00044	0.00043	U	0.00043	0.00045	U	0.00045	0.00051	U	0.00051
Dieldrin	mg/kg	0.005	0.2	0.00094	U	0.00094	0.0025	p	0.001	0.0028		0.001	0.00093	U	0.00093	0.00092	U	0.00092	0.0081		0.00096	0.045		0.0011
Endosulfan I	mg/kg	2.4	24	0.0011	U	0.0011	0.0012	U	0.0012	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0013	U	0.0013
Endosulfan II	mg/kg	2.4	24	0.0019	U	0.0019	0.002	U	0.002	0.002	U	0.002	0.0018	U	0.0018	0.0018	U	0.0018	0.0019	U	0.0019	0.0021	U	0.0021
Endosulfan sulfate	mg/kg	2.4	24	0.0009	U	0.0009	0.00097	U	0.00097	0.00098	U	0.00098	0.0009	U	0.0009	0.00088	U	0.00088	0.00093	U	0.00093	0.001	U	0.001
Endosulfan, Total	mg/kg	NA	NA	0.0011	U	0.0011	0.0012	U	0.0012	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0013	U	0.0013
Endrin	mg/kg	0.014	11	0.001	U	0.001	0.0011	U	0.0011	0.0011	U	0.0011	0.001	U	0.001	0.001	U	0.001	0.0011	U	0.0011	0.0012	U	0.0012
Endrin aldehyde	mg/kg	NA	NA	0.0017	U	0.0017	0.0018	U	0.0018	0.0018	U	0.0018	0.0017	U	0.0017	0.0017	U	0.0017	0.0017	U	0.0017	0.0019	U	0.0019
Endrin ketone	mg/kg	NA	NA	0.0014	U	0.0014	0.023	p	0.0015	0.0074	J p	0.0015	0.0014	U	0.0014	0.0014	U	0.0014	0.0014	U	0.0014	0.23		0.0016
gamma-BHC (Lindane)	mg/kg	0.1	1.3	0.00067	U	0.00067	0.00072	U	0.00072	0.00072	U	0.00072	0.00066	U	0.00066	0.00065	U	0.00065	0.00068	U	0.00068	0.00076	U	0.00076
Heptachlor	mg/kg	0.042	2.1	0.00085	U	0.00085	0.00092	U	0.00092	0.00092	U	0.00092	0.00085	U	0.00085	0.00083	U	0.00083	0.00087	U	0.00087	0.00097	U	0.00097
Heptachlor epoxide	mg/kg	NA	NA	0.0011	U	0.0011	0.0012	U	0.0012	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012
Methoxychlor	mg/kg	NA	NA	0.0016	U	0.0016	0.0018	U	0.0018	0.0018	U	0.0018	0.0016	U	0.0016	0.0016	U	0.0016	0.0017	U	0.0017	0.0019	U	0.0019
Toxaphene	mg/kg	NA	NA	0.026	U	0.026	0.028	U	0.028	0.028	U	0.028	0.026	U	0.026	0.025	U	0.025	0.027	U	0.027	0.03	U	0.03

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

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BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

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Table 1C
 Summary of Soil/Fill Sampling Results
 Pesticides
 1510 Broadway, Brooklyn, NY

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Lab Sample ID				460-182440-15			460-182440-16			460-182440-17			460-182440-18			460-182440-19			460-182440-20			460-182440-21		
Sampling Date/Time				05/20/2019 09:50:00			05/20/2019 09:55:00			05/20/2019 10:20:00			05/20/2019 10:22:00			05/20/2019 10:25:00			05/20/2019 10:30:00			05/20/2019 10:35:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil					
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
PESTICIDES																								
4,4'-DDD	mg/kg	0.0033	13	0.0012	U	0.0012	0.012	J p	0.0026	0.0047	J	0.0014	0.0095		0.0013	0.0012	U	0.0012	0.0012	U	0.0012	0.0012	U	0.0012
4,4'-DDE	mg/kg	0.0033	8.9	0.00084	U	0.00084	0.0018	U *	0.0018	0.001	U	0.001	0.0009	U	0.0009	0.00086	U	0.00086	0.00085	U	0.00085	0.00084	U	0.00084
4,4'-DDT	mg/kg	0.0033	7.9	0.0025	J	0.0013	0.55		0.0028	0.033		0.0016	0.046	p	0.0014	0.0045	J	0.0013	0.0039	J	0.0013	0.0013	U	0.0013
Aldrin	mg/kg	0.005	0.097	0.0011	U	0.0011	0.0023	U	0.0023	0.0013	U	0.0013	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011
alpha-BHC	mg/kg	0.02	0.48	0.00073	U	0.00073	0.0016	U	0.0016	0.00086	U	0.00086	0.00078	U	0.00078	0.00074	U	0.00074	0.00073	U	0.00073	0.00072	U	0.00072
beta-BHC	mg/kg	0.036	0.36	0.0008	U	0.0008	0.0017	U	0.0017	0.00095	U	0.00095	0.00086	U	0.00086	0.00082	U	0.00082	0.0008	U	0.0008	0.0008	U	0.0008
Chlordane (n.o.s.)	mg/kg	NA	NA	0.017	U	0.017	0.037	U	0.037	0.021	U	0.021	0.018	U	0.018	0.018	U	0.018	0.017	U	0.017	0.017	U	0.017
Chlordane (technical)	mg/kg	NA	NA	0.017	U	0.017	0.037	U	0.037	0.021	U	0.021	0.018	U	0.018	0.018	U	0.018	0.017	U	0.017	0.017	U	0.017
delta-BHC	mg/kg	0.04	100	0.00044	U	0.00044	0.00094	U	0.00094	0.00052	U	0.00052	0.00047	U	0.00047	0.00045	U	0.00045	0.00044	U	0.00044	0.00044	U	0.00044
Dieldrin	mg/kg	0.005	0.2	0.00093	U	0.00093	0.033		0.002	0.0025	p	0.0011	0.00099	U	0.00099	0.00095	U	0.00095	0.00093	U	0.00093	0.00093	U	0.00093
Endosulfan I	mg/kg	2.4	24	0.0011	U	0.0011	0.0023	U	0.0023	0.0013	U	0.0013	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011
Endosulfan II	mg/kg	2.4	24	0.0018	U	0.0018	0.004	U	0.004	0.0022	U	0.0022	0.002	U	0.002	0.0019	U	0.0019	0.0018	U	0.0018	0.0018	U	0.0018
Endosulfan sulfate	mg/kg	2.4	24	0.0009	U	0.0009	0.0019	U	0.0019	0.0011	U	0.0011	0.00096	U	0.00096	0.00091	U	0.00091	0.0009	U	0.0009	0.0009	U	0.0009
Endosulfan, Total	mg/kg	NA	NA	0.0011	U	0.0011	0.0023	U	0.0023	0.0013	U	0.0013	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011
Endrin	mg/kg	0.014	11	0.001	U	0.001	0.0022	U	0.0022	0.0012	U	0.0012	0.0011	U	0.0011	0.001	U	0.001	0.001	U	0.001	0.001	U	0.001
Endrin aldehyde	mg/kg	NA	NA	0.0017	U	0.0017	0.0036	U	0.0036	0.002	U	0.002	0.0018	U	0.0018	0.0017	U	0.0017	0.0017	U	0.0017	0.0017	U	0.0017
Endrin ketone	mg/kg	NA	NA	0.0014	U	0.0014	0.003	U	0.003	0.0053	J p	0.0016	0.04		0.0015	0.0014	U	0.0014	0.0014	U	0.0014	0.0014	U	0.0014
gamma-BHC (Lindane)	mg/kg	0.1	1.3	0.00066	U	0.00066	0.0014	U	0.0014	0.00079	U	0.00079	0.00071	U	0.00071	0.00067	U	0.00067	0.00067	U	0.00067	0.00066	U	0.00066
Heptachlor	mg/kg	0.042	2.1	0.00084	U	0.00084	0.0018	U	0.0018	0.001	U	0.001	0.0009	U	0.0009	0.00086	U	0.00086	0.00085	U	0.00085	0.00084	U	0.00084
Heptachlor epoxide	mg/kg	NA	NA	0.0011	U	0.0011	0.0066	J	0.0023	0.0013	U	0.0013	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011
Methoxychlor	mg/kg	NA	NA	0.0016	U	0.0016	0.0035	U	0.0035	0.0019	U	0.0019	0.0017	U	0.0017	0.0017	U	0.0017	0.0016	U	0.0016	0.0016	U	0.0016
Toxaphene	mg/kg	NA	NA	0.026	U	0.026	0.056	U	0.056	0.031	U	0.031	0.028	U	0.028	0.026	U	0.026	0.026	U	0.026	0.026	U	0.026

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1C
Summary of Soil/Fill Sampling Results
Pesticides
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-33 (7.5-8.0)			SB-33 (11.5-12)			SB-33 (17.0-17.5)			SB-34 (1.5-2.0)			SB-34 (9-9.5)			SB-34 (13-13.5)		
Lab Sample ID				460-182440-22			460-182440-23			460-182440-24			460-182440-25			460-182440-26			460-182440-27		
Sampling Date/Time				05/20/2019 10:40:00			05/20/2019 10:45:00			05/20/2019 10:50:00			05/20/2019 12:00:00			05/20/2019 12:05:00			05/20/2019 12:10:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil		
Analyte				Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
PESTICIDES																					
4,4'-DDD	mg/kg	0.0033	13	0.0012	U	0.0012	0.0012	U	0.0012	0.0012	U	0.0012	0.0031	J	0.0013	0.0012	U	0.0012	0.0013	U	0.0013
4,4'-DDE	mg/kg	0.0033	8.9	0.00081	U	0.00081	0.00084	U	0.00084	0.00082	U	0.00082	0.0021	J p	0.00089	0.0054	J	0.00082	0.00087	U	0.00087
4,4'-DDT	mg/kg	0.0033	7.9	0.0013	U	0.0013	0.0013	U	0.0013	0.0013	U	0.0013	0.009		0.0014	0.0067	J	0.0013	0.0014	U	0.0014
Aldrin	mg/kg	0.005	0.097	0.001	U	0.001	0.0011	U	0.0011	0.001	U	0.001	0.0011	U	0.0011	0.001	U	0.001	0.0011	U	0.0011
alpha-BHC	mg/kg	0.02	0.48	0.0007	U	0.0007	0.00072	U	0.00072	0.00071	U	0.00071	0.00077	U	0.00077	0.00071	U	0.00071	0.00075	U	0.00075
beta-BHC	mg/kg	0.036	0.36	0.00077	U	0.00077	0.00079	U	0.00079	0.00078	U	0.00078	0.00085	U	0.00085	0.00078	U	0.00078	0.00083	U	0.00083
Chlordane (n.o.s.)	mg/kg	NA	NA	0.017	U	0.017	0.017	U	0.017	0.017	U	0.017	0.018	U	0.018	0.017	U	0.017	0.018	U	0.018
Chlordane (technical)	mg/kg	NA	NA	0.017	U	0.017	0.017	U	0.017	0.017	U	0.017	0.018	U	0.018	0.017	U	0.017	0.018	U	0.018
delta-BHC	mg/kg	0.04	100	0.00042	U	0.00042	0.00043	U	0.00043	0.00043	U	0.00043	0.00046	U	0.00046	0.00043	U	0.00043	0.00045	U	0.00045
Dieldrin	mg/kg	0.005	0.2	0.0009	U	0.0009	0.00092	U	0.00092	0.0009	U	0.0009	0.00098	U	0.00098	0.0009	U	0.0009	0.00096	U	0.00096
Endosulfan I	mg/kg	2.4	24	0.001	U	0.001	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011
Endosulfan II	mg/kg	2.4	24	0.0018	U	0.0018	0.0018	U	0.0018	0.0018	U	0.0018	0.0019	U	0.0019	0.0018	U	0.0018	0.0019	U	0.0019
Endosulfan sulfate	mg/kg	2.4	24	0.00086	U	0.00086	0.00089	U	0.00089	0.00087	U	0.00087	0.00095	U	0.00095	0.00087	U	0.00087	0.00093	U	0.00093
Endosulfan, Total	mg/kg	NA	NA	0.001	U	0.001	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011
Endrin	mg/kg	0.014	11	0.00099	U	0.00099	0.001	U	0.001	0.001	U	0.001	0.0011	U	0.0011	0.001	U	0.001	0.0011	U	0.0011
Endrin aldehyde	mg/kg	NA	NA	0.0016	U	0.0016	0.0017	U	0.0017	0.0016	U	0.0016	0.0018	U	0.0018	0.0016	U	0.0016	0.0017	U	0.0017
Endrin ketone	mg/kg	NA	NA	0.0013	U	0.0013	0.0014	U	0.0014	0.0014	U	0.0014	0.0015	U	0.0015	0.0013	U	0.0013	0.0014	U	0.0014
gamma-BHC (Lindane)	mg/kg	0.1	1.3	0.00064	U	0.00064	0.00066	U	0.00066	0.00064	U	0.00064	0.0007	U	0.0007	0.00064	U	0.00064	0.00068	U	0.00068
Heptachlor	mg/kg	0.042	2.1	0.00081	U	0.00081	0.00084	U	0.00084	0.00082	U	0.00082	0.00089	U	0.00089	0.00082	U	0.00082	0.00087	U	0.00087
Heptachlor epoxide	mg/kg	NA	NA	0.001	U	0.001	0.0011	U	0.0011	0.001	U	0.001	0.0011	U	0.0011	0.001	U	0.001	0.0011	U	0.0011
Methoxychlor	mg/kg	NA	NA	0.0016	U	0.0016	0.0016	U	0.0016	0.0016	U	0.0016	0.0017	U	0.0017	0.0016	U	0.0016	0.0017	U	0.0017
Toxaphene	mg/kg	NA	NA	0.025	U	0.025	0.026	U	0.026	0.025	U	0.025	0.027	U	0.027	0.025	U	0.025	0.027	U	0.027

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1C
 Summary of Soil/Fill Sampling Results
 Pesticides
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-34 (15.5-16.0)			SB-35 (4.5-5.0)			SB-35 (19-19.5)			SB-35 (8-8.5)			SB-35 (13.5-14.0)			SB-36 (2-2.5)			SB-36 (6-6.5)		
Lab Sample ID				460-182440-28	460-182440-29	460-182440-30	460-182440-31	460-182440-32	460-182440-33	460-182440-34														
Sampling Date/Time				05/20/2019 12:15:00	05/20/2019 12:20:00	05/20/2019 12:35:00	05/20/2019 12:25:00	05/20/2019 12:30:00	05/20/2019 12:40:00	05/20/2019 12:45:00														
Sample Matrix				Soil	Soil	Soil	Soil	Soil	Soil	Soil														
Analyte				Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
PESTICIDES																								
4,4'-DDD	mg/kg	0.0033	13	0.0012	U	0.0012	0.0013	U	0.0013	0.0012	U	0.0012	0.0012	U	0.0012	0.0012	U	0.0012	0.056		0.0069	0.0049	J	0.0013
4,4'-DDE	mg/kg	0.0033	8.9	0.00083	U	0.00083	0.0086	p	0.00092	0.00082	U	0.00082	0.00084	U	0.00084	0.00082	U	0.00082	0.2		0.0048	0.019		0.00092
4,4'-DDT	mg/kg	0.0033	7.9	0.0021	J	0.0013	0.034		0.0014	0.0013	U	0.0013	0.0013	U	0.0013	0.0013	U	0.0013	0.45		0.0074	0.044		0.0014
Aldrin	mg/kg	0.005	0.097	0.0011	U	0.0011	0.0012	U	0.0012	0.001	U	0.001	0.0011	U	0.0011	0.001	U	0.001	0.0061	U	0.0061	0.0012	U	0.0012
alpha-BHC	mg/kg	0.02	0.48	0.00072	U	0.00072	0.00079	U	0.00079	0.0007	U	0.0007	0.00073	U	0.00073	0.00071	U	0.00071	0.0041	U	0.0041	0.00079	U	0.00079
beta-BHC	mg/kg	0.036	0.36	0.00079	U	0.00079	0.00087	U	0.00087	0.00078	U	0.00078	0.0008	U	0.0008	0.00078	U	0.00078	0.0045	U	0.0045	0.00087	U	0.00087
Chlordane (n.o.s.)	mg/kg	NA	NA	0.017	U	0.017	0.019	U	0.019	0.017	U	0.017	0.017	U	0.017	0.017	U	0.017	0.098	U	0.098	0.11		0.019
Chlordane (technical)	mg/kg	NA	NA	0.017	U	0.017	0.019	U	0.019	0.017	U	0.017	0.017	U	0.017	0.017	U	0.017	0.098	U	0.098	0.11		0.019
delta-BHC	mg/kg	0.04	100	0.00043	U	0.00043	0.00048	U	0.00048	0.00042	U	0.00042	0.00044	U	0.00044	0.00043	U	0.00043	0.0025	U	0.0025	0.00048	U	0.00048
Dieldrin	mg/kg	0.005	0.2	0.00092	U	0.00092	0.0047		0.001	0.0009	U	0.0009	0.00093	U	0.00093	0.0009	U	0.0009	0.0053	U	0.0053	0.001	U	0.001
Endosulfan I	mg/kg	2.4	24	0.0011	U	0.0011	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0062	U	0.0062	0.0012	U	0.0012
Endosulfan II	mg/kg	2.4	24	0.0018	U	0.0018	0.002	U	0.002	0.0018	U	0.0018	0.0018	U	0.0018	0.0018	U	0.0018	0.01	U	0.01	0.002	U	0.002
Endosulfan sulfate	mg/kg	2.4	24	0.00089	U	0.00089	0.00098	U	0.00098	0.00087	U	0.00087	0.0009	U	0.0009	0.00087	U	0.00087	0.0051	U	0.0051	0.00098	U	0.00098
Endosulfan, Total	mg/kg	NA	NA	0.0011	U	0.0011	0.0012	U	0.0012	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0062	U	0.0062	0.0012	U	0.0012
Endrin	mg/kg	0.014	11	0.001	U	0.001	0.0011	U	0.0011	0.00099	U	0.00099	0.001	U	0.001	0.001	U	0.001	0.0058	U	0.0058	0.0011	U	0.0011
Endrin aldehyde	mg/kg	NA	NA	0.0017	U	0.0017	0.0018	U	0.0018	0.0016	U	0.0016	0.0017	U	0.0017	0.0016	U	0.0016	0.0095	U	0.0095	0.0018	U	0.0018
Endrin ketone	mg/kg	NA	NA	0.0014	U	0.0014	0.0015	U	0.0015	0.0013	U	0.0013	0.0014	U	0.0014	0.0013	U	0.0013	0.0079	U	0.0079	0.0015	U	0.0015
gamma-BHC (Lindane)	mg/kg	0.1	1.3	0.00065	U	0.00065	0.00072	U	0.00072	0.00064	U	0.00064	0.00066	U	0.00066	0.00064	U	0.00064	0.0037	U	0.0037	0.00072	U	0.00072
Heptachlor	mg/kg	0.042	2.1	0.00083	U	0.00083	0.00092	U	0.00092	0.00082	U	0.00082	0.00084	U	0.00084	0.00082	U	0.00082	0.0048	U	0.0048	0.00092	U	0.00092
Heptachlor epoxide	mg/kg	NA	NA	0.0011	U	0.0011	0.0012	U	0.0012	0.001	U	0.001	0.0011	U	0.0011	0.001	U	0.001	0.006	U	0.006	0.0012	U	0.0012
Methoxychlor	mg/kg	NA	NA	0.0016	U	0.0016	0.0018	U	0.0018	0.0016	U	0.0016	0.0016	U	0.0016	0.0016	U	0.0016	0.0092	U	0.0092	0.0018	U	0.0018
Toxaphene	mg/kg	NA	NA	0.026	U	0.026	0.028	U	0.028	0.025	U	0.025	0.026	U	0.026	0.025	U	0.025	0.15	U	0.15	0.028	U	0.028

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

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J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

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Table 1C
Summary of Soil/Fill Sampling Results
Pesticides
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-36 (13-13.5)			SB-36 (17-17.5)			TP-5(4.5-5.0)			TP-5(9.5-10.0)			TP-5(12-12.5)			TP-6(4.5-5.0)			TP-6(9-9.5)		
Lab Sample ID				460-182440-35	460-182440-36	460-182779-1	460-182779-2	460-182779-3	460-182779-4	460-182779-5														
Sampling Date/Time				05/20/2019 12:50:00	05/20/2019 12:55:00	05/23/2019 12:20:00	05/23/2019 12:35:00	05/23/2019 12:45:00	05/23/2019 14:30:00	05/23/2019 14:35:00														
Sample Matrix				Soil	Soil	Soil	Soil	Soil	Soil	Soil														
Analyte				Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
PESTICIDES																								
4,4'-DDD	mg/kg	0.0033	13	0.0012	U	0.0012	0.0012	U	0.0012	0.0013	U	0.0013	0.031		0.0013	0.0084		0.0012	0.015		0.0012	0.0013	U	0.0013
4,4'-DDE	mg/kg	0.0033	8.9	0.00085	U	0.00085	0.00082	U	0.00082	0.0024	J p	0.00089	0.044	p	0.0009	0.011		0.00086	0.063	p	0.0008	0.037	p	0.00093
4,4'-DDT	mg/kg	0.0033	7.9	0.011		0.0013	0.0013	U	0.0013	0.0098		0.0014	0.37		0.0014	0.063		0.0013	0.19		0.0012	0.11		0.0014
Aldrin	mg/kg	0.005	0.097	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.001	U	0.001	0.0012	U	0.0012
alpha-BHC	mg/kg	0.02	0.48	0.00073	U	0.00073	0.00071	U	0.00071	0.00077	U	0.00077	0.00077	U	0.00077	0.00074	U	0.00074	0.00069	U	0.00069	0.0008	U	0.0008
beta-BHC	mg/kg	0.036	0.36	0.00081	U	0.00081	0.00078	U	0.00078	0.00084	U	0.00084	0.00085	U	0.00085	0.00081	U	0.00081	0.00076	U	0.00076	0.00088	U	0.00088
Chlordane (n.o.s.)	mg/kg	NA	NA	0.017	U	0.017	0.017	U	0.017	0.018	U	0.018	0.018	U	0.018	0.018	U	0.018	0.016	U	0.016	0.019	U	0.019
Chlordane (technical)	mg/kg	NA	NA	0.017	U	0.017	0.017	U	0.017	0.018	U	0.018	0.018	U	0.018	0.018	U	0.018	0.016	U	0.016	0.019	U	0.019
delta-BHC	mg/kg	0.04	100	0.00044	U	0.00044	0.00043	U	0.00043	0.00046	U	0.00046	0.00047	U	0.00047	0.00044	U	0.00044	0.00041	U	0.00041	0.00048	U	0.00048
Dieldrin	mg/kg	0.005	0.2	0.00094	U	0.00094	0.00091	U	0.00091	0.00098	U	0.00098	0.093		0.00099	0.00094	U	0.00094	0.00088	U	0.00088	0.015		0.001
Endosulfan I	mg/kg	2.4	24	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0011	U	0.0011	0.001	U	0.001	0.0012	U	0.0012
Endosulfan II	mg/kg	2.4	24	0.0019	U	0.0019	0.0018	U	0.0018	0.0019	U	0.0019	0.002	U	0.002	0.0019	U	0.0019	0.0017	U	0.0017	0.002	U	0.002
Endosulfan sulfate	mg/kg	2.4	24	0.0009	U	0.0009	0.00088	U	0.00088	0.00095	U	0.00095	0.00096	U	0.00096	0.00091	U	0.00091	0.00085	U	0.00085	0.00099	U	0.00099
Endosulfan, Total	mg/kg	NA	NA	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012	0.0011	U	0.0011	0.001	U	0.001	0.0012	U	0.0012
Endrin	mg/kg	0.014	11	0.001	U	0.001	0.001	U	0.001	0.0011	U	0.0011	0.0011	U	0.0011	0.001	U	0.001	0.00097	U	0.00097	0.0011	U	0.0011
Endrin aldehyde	mg/kg	NA	NA	0.0017	U	0.0017	0.0016	U	0.0016	0.0018	U	0.0018	0.0018	U	0.0018	0.0017	U	0.0017	0.0016	U	0.0016	0.0019	U	0.0019
Endrin ketone	mg/kg	NA	NA	0.0014	U	0.0014	0.0014	U	0.0014	0.0015	U	0.0015	0.0015	U	0.0015	0.0014	U	0.0014	0.0013	U	0.0013	0.0015	U	0.0015
gamma-BHC (Lindane)	mg/kg	0.1	1.3	0.00067	U	0.00067	0.0023	p	0.00065	0.0007	U	0.0007	0.0007	U	0.0007	0.00067	U	0.00067	0.00063	U	0.00063	0.00073	U	0.00073
Heptachlor	mg/kg	0.042	2.1	0.00085	U	0.00085	0.00082	U	0.00082	0.00089	U	0.00089	0.0009	U	0.0009	0.00086	U	0.00086	0.0008	U	0.0008	0.00093	U	0.00093
Heptachlor epoxide	mg/kg	NA	NA	0.0011	U	0.0011	0.001	U	0.001	0.0011	U	0.0011	0.0011	U	0.0011	0.0011	U	0.0011	0.001	U	0.001	0.0012	U	0.0012
Methoxychlor	mg/kg	NA	NA	0.0016	U	0.0016	0.0016	U	0.0016	0.0017	U	0.0017	0.0017	U	0.0017	0.0017	U	0.0017	0.0015	U	0.0015	0.0018	U	0.0018
Toxaphene	mg/kg	NA	NA	0.026	U	0.026	0.025	U	0.025	0.027	U	0.027	0.028	U	0.028	0.026	U	0.026	0.024	U	0.024	0.028	U	0.028

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1C
 Summary of Soil/Fill Sampling Results
 Pesticides
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	TP-6(11-11.5)			TP-7(4.5-5.0)			TP-7(8-8.5)			TP-7(10-10.5)			DUP-1			DUP-2			DUP-3		
Lab Sample ID				460-182779-6			460-182779-7			460-182779-8			460-182779-9			460-182440-37			460-182616-9			460-182722-21		
Sampling Date/Time				05/23/2019 14:45:00			05/23/2019 12:55:00			05/23/2019 13:05:00			05/23/2019 13:15:00			05/20/2019 00:00:00			05/21/2019 00:00:00			05/22/2019 00:00:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
PESTICIDES																								
4,4'-DDD	mg/kg	0.0033	13	0.0013	U	0.0013	0.0013	U	0.0013	0.037		0.0017	0.015		0.0015	0.0012	U	0.0012	0.0013	U	0.0013	0.0013	U	0.0013
4,4'-DDE	mg/kg	0.0033	8.9	0.00093	U	0.00093	0.018	p	0.0009	0.06	p	0.0011	0.021	p	0.0011	0.00082	U	0.00082	0.00087	U	0.00087	0.00091	U	0.00091
4,4'-DDT	mg/kg	0.0033	7.9	0.0014	U	0.0014	0.08		0.0014	0.22		0.0018	0.09		0.0017	0.0013	U	0.0013	0.0014	U	0.0014	0.0014	U	0.0014
Aldrin	mg/kg	0.005	0.097	0.0012	U	0.0012	0.0011	U	0.0011	0.0015	U	0.0015	0.0014	U	0.0014	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012
alpha-BHC	mg/kg	0.02	0.48	0.0008	U	0.0008	0.00077	U	0.00077	0.00099	U	0.00099	0.00092	U	0.00092	0.00071	U	0.00071	0.00075	U	0.00075	0.00078	U	0.00078
beta-BHC	mg/kg	0.036	0.36	0.00088	U	0.00088	0.00085	U	0.00085	0.0011	U	0.0011	0.001	U	0.001	0.00078	U	0.00078	0.00082	U	0.00082	0.00086	U	0.00086
Chlordane (n.o.s.)	mg/kg	NA	NA	0.019	U	0.019	0.018	U	0.018	0.024	U	0.024	0.022	U	0.022	0.017	U	0.017	0.018	U	0.018	0.019	U	0.019
Chlordane (technical)	mg/kg	NA	NA	0.019	U	0.019	0.018	U	0.018	0.024	U	0.024	0.022	U	0.022	0.017	U	0.017	0.018	U	0.018	0.019	U	0.019
delta-BHC	mg/kg	0.04	100	0.00048	U	0.00048	0.00046	U	0.00046	0.0006	U	0.0006	0.00055	U	0.00055	0.00043	U	0.00043	0.00045	U	0.00045	0.00047	U	0.00047
Dieldrin	mg/kg	0.005	0.2	0.001	U	0.001	0.0072		0.00099	0.021		0.0013	0.011		0.0012	0.00091	U	0.00091	0.00096	U	0.00096	0.001	U	0.001
Endosulfan I	mg/kg	2.4	24	0.0012	U	0.0012	0.0012	U	0.0012	0.0015	U	0.0015	0.0014	U	0.0014	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012
Endosulfan II	mg/kg	2.4	24	0.002	U	0.002	0.0019	U	0.0019	0.0025	U	0.0025	0.0023	U	0.0023	0.0018	U	0.0018	0.0019	U	0.0019	0.002	U	0.002
Endosulfan sulfate	mg/kg	2.4	24	0.00098	U	0.00098	0.00095	U	0.00095	0.0012	U	0.0012	0.0011	U	0.0011	0.00087	U	0.00087	0.00092	U	0.00092	0.00097	U	0.00097
Endosulfan, Total	mg/kg	NA	NA	0.0012	U	0.0012	0.0012	U	0.0012	0.0015	U	0.0015	0.0014	U	0.0014	0.0011	U	0.0011	0.0011	U	0.0011	0.0012	U	0.0012
Endrin	mg/kg	0.014	11	0.0011	U	0.0011	0.0011	U	0.0011	0.0014	U	0.0014	0.0013	U	0.0013	0.001	U	0.001	0.0011	U	0.0011	0.0011	U	0.0011
Endrin aldehyde	mg/kg	NA	NA	0.0019	U	0.0019	0.0018	U	0.0018	0.0023	U	0.0023	0.0021	U	0.0021	0.0016	U	0.0016	0.0017	U	0.0017	0.0018	U	0.0018
Endrin ketone	mg/kg	NA	NA	0.0015	U	0.0015	0.0015	U	0.0015	0.0019	U	0.0019	0.012	p	0.0018	0.0014	U	0.0014	0.0014	U	0.0014	0.0015	U	0.0015
gamma-BHC (Lindane)	mg/kg	0.1	1.3	0.00073	U	0.00073	0.0007	U	0.0007	0.0009	U	0.0009	0.00084	U	0.00084	0.00065	U	0.00065	0.00068	U	0.00068	0.00071	U	0.00071
Heptachlor	mg/kg	0.042	2.1	0.00093	U	0.00093	0.0009	U	0.0009	0.0011	U	0.0011	0.0011	U	0.0011	0.00082	U	0.00082	0.00087	U	0.00087	0.00091	U	0.00091
Heptachlor epoxide	mg/kg	NA	NA	0.0012	U	0.0012	0.0011	U	0.0011	0.0015	U	0.0015	0.0014	U	0.0014	0.001	U	0.001	0.0011	U	0.0011	0.0012	U	0.0012
Methoxychlor	mg/kg	NA	NA	0.0018	U	0.0018	0.0017	U	0.0017	0.0022	U	0.0022	0.0021	U	0.0021	0.0016	U	0.0016	0.0017	U	0.0017	0.0018	U	0.0018
Toxaphene	mg/kg	NA	NA	0.028	U	0.028	0.027	U	0.027	0.035	U	0.035	0.033	U	0.033	0.025	U	0.025	0.027	U	0.027	0.028	U	0.028

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1D
Summary of Soil/Fill Sampling Results
Total PCBs
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-14(3-3.5)			SB-14(8-8.5)			SB-14(14.5-15)			SB-14(19-19.5)			SB-15(2-2.5)			SB-15(9-9.5)			
Lab Sample ID				460-182722-9			460-182722-10			460-182722-11			460-182722-12			460-182722-13			460-182722-14			
Sample Date/Time				05/22/2019 09:05:00			05/22/2019 09:15:00			05/22/2019 09:20:00			05/22/2019 09:25:00			05/22/2019 10:45:00			05/22/2019 10:50:00			
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
PCBS																						
Aroclor 1016	mg/kg	NA	NA	0.011	U	0.011	0.014	U	0.014	0.0098	U	0.0098	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012	
Aroclor 1221	mg/kg	NA	NA	0.011	U	0.011	0.014	U	0.014	0.0098	U	0.0098	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012	
Aroclor 1232	mg/kg	NA	NA	0.011	U	0.011	0.014	U	0.014	0.0098	U	0.0098	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012	
Aroclor 1242	mg/kg	NA	NA	0.011	U	0.011	0.014	U	0.014	0.0098	U	0.0098	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012	
Aroclor 1248	mg/kg	NA	NA	0.011	U	0.011	0.014	U	0.014	0.0098	U	0.0098	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012	
Aroclor 1254	mg/kg	NA	NA	0.011	U	0.011	0.014	U	0.014	0.01	U	0.01	0.01	U	0.01	0.011	U	0.011	0.013	U	0.013	
Aroclor 1260	mg/kg	NA	NA	0.011	U	0.011	0.014	U	0.014	0.01	U	0.01	0.01	U	0.01	0.011	U	0.011	0.013	U	0.013	
Aroclor 1268	mg/kg	NA	NA	0.011	U	0.011	0.014	U	0.014	0.01	U	0.01	0.01	U	0.01	0.011	U	0.011	0.013	U	0.013	
Aroclor-1262	mg/kg	NA	NA	0.011	U	0.011	0.014	U	0.014	0.01	U	0.01	0.01	U	0.01	0.011	U	0.011	0.013	U	0.013	
Total PCBs	mg/kg	0.1	1	0.011	U	0.011	0.014	U	0.014	0.01	U	0.01	0.01	U	0.01	0.011	U	0.011	0.013	U	0.013	

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1D
Summary of Soil/Fill Sampling Results
Total PCBs
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-15(12.5-13)			SB-15(18-18.5)			SB-16(4-4.5)			SB-16(9.5-10)			SB-16(11.5-12)			SB-16(16-16.5)			
Lab Sample ID				460-182722-15			460-182722-16			460-182722-5			460-182722-6			460-182722-7			460-182722-8			
Sample Date/Time				05/22/2019 09:55:00			05/22/2019 11:00:00			05/22/2019 08:15:00			05/22/2019 08:20:00			05/22/2019 08:30:00			05/22/2019 08:35:00			
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
PCBS																						
Aroclor 1016	mg/kg	NA	NA	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.011	U	0.011	
Aroclor 1221	mg/kg	NA	NA	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.011	U	0.011	
Aroclor 1232	mg/kg	NA	NA	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.011	U	0.011	
Aroclor 1242	mg/kg	NA	NA	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.011	U	0.011	
Aroclor 1248	mg/kg	NA	NA	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.011	U	0.011	0.15		0.01	0.096		0.011	
Aroclor 1254	mg/kg	NA	NA	0.012	U	0.012	0.01	U	0.01	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	
Aroclor 1260	mg/kg	NA	NA	0.012	U	0.012	0.01	U	0.01	0.011	U	0.011	0.011	U	0.011	0.13		0.011	0.012	U	0.012	
Aroclor 1268	mg/kg	NA	NA	0.012	U	0.012	0.01	U	0.01	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	
Aroclor-1262	mg/kg	NA	NA	0.012	U	0.012	0.01	U	0.01	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	
Total PCBs	mg/kg	0.1	1	0.012	U	0.012	0.01	U	0.01	0.011	U	0.011	0.011	U	0.011	0.28		0.011	0.096		0.012	

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1D
Summary of Soil/Fill Sampling Results
Total PCBs
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-19(2-2.5)			SB-19(6-6.5)			SB-19(13.5-14)			SB-19(17-17.5)			SB-20(4.5-5)			SB-20(6.5-7)			
Lab Sample ID				460-182722-1			460-182722-2			460-182722-3			460-182722-4			460-182722-17			460-182722-18			
Sample Date/Time				05/22/2019 07:55:00			05/22/2019 08:00:00			05/22/2019 08:05:00			05/22/2019 08:10:00			05/22/2019 11:15:00			05/22/2019 11:20:00			
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
PCBS																						
Aroclor 1016	mg/kg	NA	NA	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	0.012	U	0.012	
Aroclor 1221	mg/kg	NA	NA	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	0.012	U	0.012	
Aroclor 1232	mg/kg	NA	NA	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	0.012	U	0.012	
Aroclor 1242	mg/kg	NA	NA	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	0.012	U	0.012	
Aroclor 1248	mg/kg	NA	NA	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.075	U	0.0099	0.012	U	0.012	
Aroclor 1254	mg/kg	NA	NA	0.011	U	0.011	0.011	U	0.011	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.012	U	0.012	
Aroclor 1260	mg/kg	NA	NA	0.011	U	0.011	0.011	U	0.011	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.012	U	0.012	
Aroclor 1268	mg/kg	NA	NA	0.011	U	0.011	0.011	U	0.011	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.012	U	0.012	
Aroclor-1262	mg/kg	NA	NA	0.011	U	0.011	0.011	U	0.011	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.012	U	0.012	
Total PCBs	mg/kg	0.1	1	0.011	U	0.011	0.011	U	0.011	0.01	U	0.01	0.011	U	0.011	0.075	U	0.01	0.012	U	0.012	

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

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* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1D
Summary of Soil/Fill Sampling Results
Total PCBs
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-20(10.5-11)			SB-20(16-16.5)			SB-21 (1-1.5)			SB-21 (7-7.5)			SB-21 (12.5-13)			SB-21 (18-18.5)			
Lab Sample ID				460-182722-19			460-182722-20			460-182616-1			460-182616-2			460-182616-3			460-182616-4			
Sample Date/Time				05/22/2019 11:25:00			05/22/2019 11:30:00			05/21/2019 13:00:00			05/21/2019 13:10:00			05/21/2019 13:20:00			05/21/2019 13:30:00			
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
PCBS																						
Aroclor 1016	mg/kg	NA	NA	0.0095	U	0.0095	0.0092	U	0.0092	0.011	U	0.011	0.0098	U	0.0098	0.0099	U	0.0099	0.0097	U	0.0097	
Aroclor 1221	mg/kg	NA	NA	0.0095	U	0.0095	0.0092	U	0.0092	0.011	U	0.011	0.0098	U	0.0098	0.0099	U	0.0099	0.0097	U	0.0097	
Aroclor 1232	mg/kg	NA	NA	0.0095	U	0.0095	0.0092	U	0.0092	0.011	U	0.011	0.0098	U	0.0098	0.0099	U	0.0099	0.0097	U	0.0097	
Aroclor 1242	mg/kg	NA	NA	0.0095	U	0.0095	0.0092	U	0.0092	0.011	U	0.011	0.0098	U	0.0098	0.0099	U	0.0099	0.0097	U	0.0097	
Aroclor 1248	mg/kg	NA	NA	0.0095	U	0.0095	0.0092	U	0.0092	0.011	U	0.011	0.0098	U	0.0098	0.0099	U	0.0099	0.0097	U	0.0097	
Aroclor 1254	mg/kg	NA	NA	0.0098	U	0.0098	0.0095	U	0.0095	0.5		0.011	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	
Aroclor 1260	mg/kg	NA	NA	0.0098	U	0.0098	0.0095	U	0.0095	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	
Aroclor 1268	mg/kg	NA	NA	0.0098	U	0.0098	0.0095	U	0.0095	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	
Aroclor-1262	mg/kg	NA	NA	0.0098	U	0.0098	0.0095	U	0.0095	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	
Total PCBs	mg/kg	0.1	1	0.0098	U	0.0098	0.0095	U	0.0095	0.5		0.011	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1D
Summary of Soil/Fill Sampling Results
Total PCBs
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-22 (3.5-4)			SB-22 (6-6.5)			SB-22 (14-14.5)			SB-22 (16.5-17)			SB-23 (4-4.5)			SB-23 (6.5-7)			
Lab Sample ID				460-182616-5			460-182616-6			460-182616-7			460-182616-8			460-182440-1			460-182440-2			
Sample Date/Time				05/21/2019 13:45:00			05/21/2019 13:50:00			05/21/2019 14:00:00			05/21/2019 14:05:00			05/20/2019 09:00:00			05/20/2019 09:05:00			
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
PCBS																						
Aroclor 1016	mg/kg	NA	NA	0.011	U	0.011	0.01	U	0.01	0.0099	U	0.0099	0.0095	U	0.0095	0.009	U	0.009	0.012	U	0.012	
Aroclor 1221	mg/kg	NA	NA	0.011	U	0.011	0.01	U	0.01	0.0099	U	0.0099	0.0095	U	0.0095	0.009	U	0.009	0.012	U	0.012	
Aroclor 1232	mg/kg	NA	NA	0.011	U	0.011	0.01	U	0.01	0.0099	U	0.0099	0.0095	U	0.0095	0.009	U	0.009	0.012	U	0.012	
Aroclor 1242	mg/kg	NA	NA	0.011	U	0.011	0.01	U	0.01	0.0099	U	0.0099	0.0095	U	0.0095	0.009	U	0.009	0.012	U	0.012	
Aroclor 1248	mg/kg	NA	NA	0.011	U	0.011	0.01	U	0.01	0.0099	U	0.0099	0.0095	U	0.0095	0.009	U	0.009	0.012	U	0.012	
Aroclor 1254	mg/kg	NA	NA	0.011	U	0.011	0.011	U	0.011	0.01	U	0.01	0.0098	U	0.0098	0.0093	U	0.0093	0.012	U	0.012	
Aroclor 1260	mg/kg	NA	NA	0.011	U	0.011	0.011	U	0.011	0.01	U	0.01	0.0098	U	0.0098	0.0093	U	0.0093	0.012	U	0.012	
Aroclor 1268	mg/kg	NA	NA	0.011	U	0.011	0.011	U	0.011	0.01	U	0.01	0.0098	U	0.0098	0.0093	U	0.0093	0.012	U	0.012	
Aroclor-1262	mg/kg	NA	NA	0.011	U	0.011	0.011	U	0.011	0.01	U	0.01	0.0098	U	0.0098	0.0093	U	0.0093	0.012	U	0.012	
Total PCBs	mg/kg	0.1	1	0.011	U	0.011	0.011	U	0.011	0.01	U	0.01	0.0098	U	0.0098	0.0093	U	0.0093	0.012	U	0.012	

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1D
Summary of Soil/Fill Sampling Results
Total PCBs
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-23 (12.5-13.0)			SB-23 (19-19.5)			SB-29 (3-3.5)			SB-29 (7-7.5)			SB-29 (14.5-15)			SB-29 (18-18.5)			
Lab Sample ID				460-182440-3			460-182440-4			460-182440-5			460-182440-6			460-182440-7			460-182440-8			
Sample Date/Time				05/20/2019 09:10:00			05/20/2019 09:15:00			05/20/2019 10:00:00			05/20/2019 10:05:00			05/20/2019 10:10:00			05/20/2019 10:15:00			
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
PCBS																						
Aroclor 1016	mg/kg	NA	NA	0.0096	U	0.0096	0.0099	U	0.0099	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	0.0096	U	0.0096	
Aroclor 1221	mg/kg	NA	NA	0.0096	U	0.0096	0.0099	U	0.0099	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	0.0096	U	0.0096	
Aroclor 1232	mg/kg	NA	NA	0.0096	U	0.0096	0.0099	U	0.0099	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	0.0096	U	0.0096	
Aroclor 1242	mg/kg	NA	NA	0.0096	U	0.0096	0.0099	U	0.0099	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	0.0096	U	0.0096	
Aroclor 1248	mg/kg	NA	NA	0.0096	U	0.0096	0.0099	U	0.0099	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	0.0096	U	0.0096	
Aroclor 1254	mg/kg	NA	NA	0.01	U	0.01	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	
Aroclor 1260	mg/kg	NA	NA	0.01	U	0.01	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	
Aroclor 1268	mg/kg	NA	NA	0.01	U	0.01	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	
Aroclor-1262	mg/kg	NA	NA	0.01	U	0.01	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	
Total PCBs	mg/kg	0.1	1	0.01	U	0.01	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

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J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1D
Summary of Soil/Fill Sampling Results
Total PCBs
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-30 (2-2.5)			SB-30 (8.5-9.0)			SB-30 (16.5-17.0)			SB-30 (13-13.5)			SB-31 (1-1.5)			SB-31 (9-9.5)		
Lab Sample ID				460-182440-9			460-182440-10			460-182440-11			460-182440-12			460-182440-13			460-182440-14		
Sample Date/Time				05/20/2019 09:20:00			05/20/2019 09:25:00			05/20/2019 09:35:00			05/20/2019 09:30:00			05/20/2019 09:40:00			05/20/2019 09:45:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
PCBS																					
Aroclor 1016	mg/kg	NA	NA	0.01	U	0.01	0.01	U	0.01	0.0095	U	0.0095	0.0094	U	0.0094	0.0098	U	0.0098	0.011	U	0.011
Aroclor 1221	mg/kg	NA	NA	0.01	U	0.01	0.01	U	0.01	0.0095	U	0.0095	0.0094	U	0.0094	0.0098	U	0.0098	0.011	U	0.011
Aroclor 1232	mg/kg	NA	NA	0.01	U	0.01	0.01	U	0.01	0.0095	U	0.0095	0.0094	U	0.0094	0.0098	U	0.0098	0.011	U	0.011
Aroclor 1242	mg/kg	NA	NA	0.01	U	0.01	0.01	U	0.01	0.0095	U	0.0095	0.0094	U	0.0094	0.0098	U	0.0098	0.011	U	0.011
Aroclor 1248	mg/kg	NA	NA	0.01	U	0.01	0.01	U	0.01	0.0095	U	0.0095	0.0094	U	0.0094	0.0098	U	0.0098	0.011	U	0.011
Aroclor 1254	mg/kg	NA	NA	0.011	U	0.011	0.011	U	0.011	0.0098	U	0.0098	0.0097	U	0.0097	0.01	U	0.01	0.011	U	0.011
Aroclor 1260	mg/kg	NA	NA	0.011	U	0.011	0.011	U	0.011	0.0098	U	0.0098	0.0097	U	0.0097	0.01	U	0.01	0.011	U	0.011
Aroclor 1268	mg/kg	NA	NA	0.011	U	0.011	0.011	U	0.011	0.0098	U	0.0098	0.0097	U	0.0097	0.01	U	0.01	0.011	U	0.011
Aroclor-1262	mg/kg	NA	NA	0.011	U	0.011	0.011	U	0.011	0.0098	U	0.0098	0.0097	U	0.0097	0.01	U	0.01	0.011	U	0.011
Total PCBs	mg/kg	0.1	1	0.011	U	0.011	0.011	U	0.011	0.0098	U	0.0098	0.0097	U	0.0097	0.01	U	0.01	0.011	U	0.011

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1D
 Summary of Soil/Fill Sampling Results
 Total PCBs
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-31 (11-11.5)			SB-31 (16.5-17)			SB-32 (4-4.5)			SB-32 (7-7.5)			SB-32 (14.5-15)			SB-32 (18-18.5)			
Lab Sample ID				460-182440-15			460-182440-16			460-182440-17			460-182440-18			460-182440-19			460-182440-20			
Sample Date/Time				05/20/2019 09:50:00			05/20/2019 09:55:00			05/20/2019 10:20:00			05/20/2019 10:22:00			05/20/2019 10:25:00			05/20/2019 10:30:00			
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
PCBS																						
Aroclor 1016	mg/kg	NA	NA	0.0095	U	0.0095	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.0097	U	0.0097	0.0095	U	0.0095	
Aroclor 1221	mg/kg	NA	NA	0.0095	U	0.0095	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.0097	U	0.0097	0.0095	U	0.0095	
Aroclor 1232	mg/kg	NA	NA	0.0095	U	0.0095	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.0097	U	0.0097	0.0095	U	0.0095	
Aroclor 1242	mg/kg	NA	NA	0.0095	U	0.0095	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.0097	U	0.0097	0.0095	U	0.0095	
Aroclor 1248	mg/kg	NA	NA	0.0095	U	0.0095	0.01	U	0.01	0.011	U	0.011	0.01	U	0.01	0.0097	U	0.0097	0.0095	U	0.0095	
Aroclor 1254	mg/kg	NA	NA	0.0098	U	0.0098	0.011	U	0.011	0.012	U	0.012	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	
Aroclor 1260	mg/kg	NA	NA	0.0098	U	0.0098	0.011	U	0.011	0.012	U	0.012	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	
Aroclor 1268	mg/kg	NA	NA	0.0098	U	0.0098	0.011	U	0.011	0.012	U	0.012	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	
Aroclor-1262	mg/kg	NA	NA	0.0098	U	0.0098	0.011	U	0.011	0.012	U	0.012	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	
Total PCBs	mg/kg	0.1	1	0.0098	U	0.0098	0.011	U	0.011	0.012	U	0.012	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

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Detected above the Restricted Residential SCO

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J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

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Table 1D
Summary of Soil/Fill Sampling Results
Total PCBs
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-33 (3.5-4.0)			SB-33 (7.5-8.0)			SB-33 (11.5-12)			SB-33 (17.0-17.5)			SB-34 (1.5-2.0)			SB-34 (9-9.5)			
Lab Sample ID				460-182440-21			460-182440-22			460-182440-23			460-182440-24			460-182440-25			460-182440-26			
Sample Date/Time				05/20/2019 10:35:00			05/20/2019 10:40:00			05/20/2019 10:45:00			05/20/2019 10:50:00			05/20/2019 12:00:00			05/20/2019 12:05:00			
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
PCBS																						
Aroclor 1016	mg/kg	NA	NA	0.0095	U	0.0095	0.0092	U	0.0092	0.0094	U	0.0094	0.0092	U	0.0092	0.01	U	0.01	0.0092	U	0.0092	
Aroclor 1221	mg/kg	NA	NA	0.0095	U	0.0095	0.0092	U	0.0092	0.0094	U	0.0094	0.0092	U	0.0092	0.01	U	0.01	0.0092	U	0.0092	
Aroclor 1232	mg/kg	NA	NA	0.0095	U	0.0095	0.0092	U	0.0092	0.0094	U	0.0094	0.0092	U	0.0092	0.01	U	0.01	0.0092	U	0.0092	
Aroclor 1242	mg/kg	NA	NA	0.0095	U	0.0095	0.0092	U	0.0092	0.0094	U	0.0094	0.0092	U	0.0092	0.01	U	0.01	0.0092	U	0.0092	
Aroclor 1248	mg/kg	NA	NA	0.0095	U	0.0095	0.0092	U	0.0092	0.0094	U	0.0094	0.0092	U	0.0092	0.01	U	0.01	0.0092	U	0.0092	
Aroclor 1254	mg/kg	NA	NA	0.0098	U	0.0098	0.0095	U	0.0095	0.0097	U	0.0097	0.0096	U	0.0096	0.01	U	0.01	0.0095	U	0.0095	
Aroclor 1260	mg/kg	NA	NA	0.0098	U	0.0098	0.0095	U	0.0095	0.0097	U	0.0097	0.0096	U	0.0096	0.01	U	0.01	0.0095	U	0.0095	
Aroclor 1268	mg/kg	NA	NA	0.0098	U	0.0098	0.0095	U	0.0095	0.0097	U	0.0097	0.0096	U	0.0096	0.01	U	0.01	0.0095	U	0.0095	
Aroclor-1262	mg/kg	NA	NA	0.0098	U	0.0098	0.0095	U	0.0095	0.0097	U	0.0097	0.0096	U	0.0096	0.01	U	0.01	0.0095	U	0.0095	
Total PCBs	mg/kg	0.1	1	0.0098	U	0.0098	0.0095	U	0.0095	0.0097	U	0.0097	0.0096	U	0.0096	0.01	U	0.01	0.0095	U	0.0095	

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

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Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

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Table 1D
 Summary of Soil/Fill Sampling Results
 Total PCBs
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-34 (13-13.5)			SB-34 (15.5-16.0)			SB-35 (4.5-5.0)			SB-35 (19-19.5)			SB-35 (8-8.5)			SB-35 (13.5-14.0)			
Lab Sample ID				460-182440-27			460-182440-28			460-182440-29			460-182440-30			460-182440-31			460-182440-32			
Sample Date/Time				05/20/2019 12:10:00			05/20/2019 12:15:00			05/20/2019 12:20:00			05/20/2019 12:35:00			05/20/2019 12:25:00			05/20/2019 12:30:00			
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
PCBS																						
Aroclor 1016	mg/kg	NA	NA	0.0098	U	0.0098	0.0094	U	0.0094	0.01	U	0.01	0.0092	U	0.0092	0.0095	U	0.0095	0.0092	U	0.0092	
Aroclor 1221	mg/kg	NA	NA	0.0098	U	0.0098	0.0094	U	0.0094	0.01	U	0.01	0.0092	U	0.0092	0.0095	U	0.0095	0.0092	U	0.0092	
Aroclor 1232	mg/kg	NA	NA	0.0098	U	0.0098	0.0094	U	0.0094	0.01	U	0.01	0.0092	U	0.0092	0.0095	U	0.0095	0.0092	U	0.0092	
Aroclor 1242	mg/kg	NA	NA	0.0098	U	0.0098	0.0094	U	0.0094	0.01	U	0.01	0.0092	U	0.0092	0.0095	U	0.0095	0.0092	U	0.0092	
Aroclor 1248	mg/kg	NA	NA	0.0098	U	0.0098	0.0094	U	0.0094	0.01	U	0.01	0.0092	U	0.0092	0.0095	U	0.0095	0.0092	U	0.0092	
Aroclor 1254	mg/kg	NA	NA	0.01	U	0.01	0.0097	U	0.0097	0.011	U	0.011	0.0095	U	0.0095	0.0098	U	0.0098	0.0096	U	0.0096	
Aroclor 1260	mg/kg	NA	NA	0.01	U	0.01	0.0097	U	0.0097	0.011	U	0.011	0.0095	U	0.0095	0.0098	U	0.0098	0.0096	U	0.0096	
Aroclor 1268	mg/kg	NA	NA	0.01	U	0.01	0.0097	U	0.0097	0.011	U	0.011	0.0095	U	0.0095	0.0098	U	0.0098	0.0096	U	0.0096	
Aroclor-1262	mg/kg	NA	NA	0.01	U	0.01	0.0097	U	0.0097	0.011	U	0.011	0.0095	U	0.0095	0.0098	U	0.0098	0.0096	U	0.0096	
Total PCBs	mg/kg	0.1	1	0.01	U	0.01	0.0097	U	0.0097	0.011	U	0.011	0.0095	U	0.0095	0.0098	U	0.0098	0.0096	U	0.0096	

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1D
Summary of Soil/Fill Sampling Results
Total PCBs
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	SB-36 (2-2.5)			SB-36 (6-6.5)			SB-36 (13-13.5)			SB-36 (17-17.5)			TP-5(4.5-5.0)			TP-5(9.5-10.0)			
Lab Sample ID				460-182440-33			460-182440-34			460-182440-35			460-182440-36			460-182779-1			460-182779-2			
Sample Date/Time				05/20/2019 12:40:00			05/20/2019 12:45:00			05/20/2019 12:50:00			05/20/2019 12:55:00			05/23/2019 12:20:00			05/23/2019 12:35:00			
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
PCBS																						
Aroclor 1016	mg/kg	NA	NA	0.011	U	0.011	0.01	U	0.01	0.0096	U	0.0096	0.0093	U	0.0093	0.01	U	0.01	0.01	U	0.01	
Aroclor 1221	mg/kg	NA	NA	0.011	U	0.011	0.01	U	0.01	0.0096	U	0.0096	0.0093	U	0.0093	0.01	U	0.01	0.01	U	0.01	
Aroclor 1232	mg/kg	NA	NA	0.011	U	0.011	0.01	U	0.01	0.0096	U	0.0096	0.0093	U	0.0093	0.01	U	0.01	0.01	U	0.01	
Aroclor 1242	mg/kg	NA	NA	0.011	U	0.011	0.01	U	0.01	0.0096	U	0.0096	0.0093	U	0.0093	0.01	U	0.01	0.01	U	0.01	
Aroclor 1248	mg/kg	NA	NA	0.011	U	0.011	0.01	U	0.01	0.0096	U	0.0096	0.0093	U	0.0093	0.01	U	0.01	0.01	U	0.01	
Aroclor 1254	mg/kg	NA	NA	0.011	U	0.011	0.011	U	0.011	0.0099	U	0.0099	0.0096	U	0.0096	0.01	U	0.01	0.01	U	0.01	
Aroclor 1260	mg/kg	NA	NA	0.011	U	0.011	0.011	U	0.011	0.0099	U	0.0099	0.0096	U	0.0096	0.01	U	0.01	0.077	U	0.01	
Aroclor 1268	mg/kg	NA	NA	0.011	U	0.011	0.011	U	0.011	0.0099	U	0.0099	0.0096	U	0.0096	0.01	U	0.01	0.01	U	0.01	
Aroclor-1262	mg/kg	NA	NA	0.011	U	0.011	0.011	U	0.011	0.0099	U	0.0099	0.0096	U	0.0096	0.01	U	0.01	0.01	U	0.01	
Total PCBs	mg/kg	0.1	1	0.011	U	0.011	0.011	U	0.011	0.0099	U	0.0099	0.0096	U	0.0096	0.01	U	0.01	0.077	U	0.01	

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1D
 Summary of Soil/Fill Sampling Results
 Total PCBs
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	TP-5(12-12.5)			TP-6(4.5-5.0)			TP-6(9-9.5)			TP-6(11-11.5)			TP-7(4.5-5.0)			TP-7(8-8.5)			
Lab Sample ID				460-182779-3			460-182779-4			460-182779-5			460-182779-6			460-182779-7			460-182779-8			
Sample Date/Time				05/23/2019 12:45:00			05/23/2019 14:30:00			05/23/2019 14:35:00			05/23/2019 14:45:00			05/23/2019 12:55:00			05/23/2019 13:05:00			
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil			
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
PCBS																						
Aroclor 1016	mg/kg	NA	NA	0.0096	U	0.0096	0.009	U	0.009	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.013	U	0.013	
Aroclor 1221	mg/kg	NA	NA	0.0096	U	0.0096	0.009	U	0.009	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.013	U	0.013	
Aroclor 1232	mg/kg	NA	NA	0.0096	U	0.0096	0.009	U	0.009	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.013	U	0.013	
Aroclor 1242	mg/kg	NA	NA	0.0096	U	0.0096	0.009	U	0.009	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.013	U	0.013	
Aroclor 1248	mg/kg	NA	NA	0.0096	U	0.0096	0.009	U	0.009	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.013	U	0.013	
Aroclor 1254	mg/kg	NA	NA	0.01	U	0.01	0.0093	U	0.0093	0.011	U	0.011	0.011	U	0.011	0.01	U	0.01	0.013	U	0.013	
Aroclor 1260	mg/kg	NA	NA	0.01	U	0.01	0.15		0.0093	0.011	U	0.011	0.011	U	0.011	0.01	U	0.01	0.11		0.013	
Aroclor 1268	mg/kg	NA	NA	0.01	U	0.01	0.0093	U	0.0093	0.011	U	0.011	0.011	U	0.011	0.01	U	0.01	0.013	U	0.013	
Aroclor-1262	mg/kg	NA	NA	0.01	U	0.01	0.0093	U	0.0093	0.011	U	0.011	0.011	U	0.011	0.01	U	0.01	0.013	U	0.013	
Total PCBs	mg/kg	0.1	1	0.01	U	0.01	0.15		0.0093	0.011	U	0.011	0.011	U	0.011	0.01	U	0.01	0.11		0.013	

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1D
Summary of Soil/Fill Sampling Results
Total PCBs
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives	TP-7(10-10.5)			DUP-1			DUP-2			DUP-3			
Lab Sample ID				460-182779-9			460-182440-37			460-182616-9			460-182722-21			
Sample Date/Time				05/23/2019 13:15:00			05/20/2019 00:00:00			05/21/2019 00:00:00			05/22/2019 00:00:00			
Sample Matrix				Soil			Soil			Soil			Soil			
Analyte				Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
PCBS																
Aroclor 1016	mg/kg	NA	NA	0.012	U	0.012	0.0093	U	0.0093	0.0098	U	0.0098	0.01	U	0.01	
Aroclor 1221	mg/kg	NA	NA	0.012	U	0.012	0.0093	U	0.0093	0.0098	U	0.0098	0.01	U	0.01	
Aroclor 1232	mg/kg	NA	NA	0.012	U	0.012	0.0093	U	0.0093	0.0098	U	0.0098	0.01	U	0.01	
Aroclor 1242	mg/kg	NA	NA	0.012	U	0.012	0.0093	U	0.0093	0.0098	U	0.0098	0.01	U	0.01	
Aroclor 1248	mg/kg	NA	NA	0.012	U	0.012	0.0093	U	0.0093	0.0098	U	0.0098	0.01	U	0.01	
Aroclor 1254	mg/kg	NA	NA	0.012	U	0.012	0.0096	U	0.0096	0.01	U	0.01	0.011	U	0.011	
Aroclor 1260	mg/kg	NA	NA	0.012	U	0.012	0.0096	U	0.0096	0.01	U	0.01	0.011	U	0.011	
Aroclor 1268	mg/kg	NA	NA	0.012	U	0.012	0.0096	U	0.0096	0.01	U	0.01	0.011	U	0.011	
Aroclor-1262	mg/kg	NA	NA	0.012	U	0.012	0.0096	U	0.0096	0.01	U	0.01	0.011	U	0.011	
Total PCBs	mg/kg	0.1	1	0.012	U	0.012	0.0096	U	0.0096	0.01	U	0.01	0.011	U	0.011	

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection Limit

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

* - Laboratory Control Sample/Laboratory Control Sample Duplicate is outside acceptance limits

B - Constituent was found in the laboratory blank and the sample

F1 - Matrix Spike/Matrix Spike Duplicate recovery is outside acceptance limits

F2 - MS/MSD relative percent difference exceeds the control limits

Table 1E
 Summary of Soil/Fill Sampling Results
 Metals
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup	SB-14(3-3.5)			SB-14(8-8.5)			SB-14(14.5-15)			SB-14(19-19.5)			SB-15(2-2.5)			SB-15(9-9.5)		
Lab Sample ID				460-182722-9			460-182722-10			460-182722-11			460-182722-12			460-182722-13			460-182722-14		
Sampling Date/Time				05/22/2019 09:05:00			05/22/2019 09:15:00			05/22/2019 09:20:00			05/22/2019 09:25:00			05/22/2019 10:45:00			05/22/2019 10:50:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
METALS																					
Aluminum	mg/kg	NA	NA	6530		11.2	9860		13.7	6400		10.1	3750		10	4950		9.9	10200		12.6
Antimony	mg/kg	NA	NA	1	U	1	1.3	U	1.3	0.94	U	0.94	0.94	U	0.94	0.93	U	0.93	1.2	U	1.2
Arsenic	mg/kg	13	16	3.2		1.2	4		1.4	4		1	2.5	J	1	3.5		1	3.9		1.3
Barium	mg/kg	350	400	104		2.2	92.7		2.7	38.2		2	40		2	116		2	184		2.5
Beryllium	mg/kg	7.2	72	0.45		0.088	0.61		0.11	0.81		0.079	0.38		0.079	0.32	J	0.078	0.68		0.099
Cadmium	mg/kg	2.5	4.3	0.23	J	0.13	0.16	U	0.16	0.12	U	0.12	0.12	U	0.12	0.17	J	0.12	0.15	U	0.15
Calcium	mg/kg	NA	NA	3420		58.3	2180		71.2	931		52.5	1440		52.2	2500		51.8	3410		65.6
Chromium	mg/kg	NA	NA	20		0.35	22.8		0.43	24		0.32	10.5		0.32	14.3		0.31	19.7		0.4
Cobalt	mg/kg	NA	NA	6.5	J	1.2	7.5	J	1.5	8	J	1.1	4.7	J	1.1	4.1	J	1.1	7.7	J	1.4
Copper	mg/kg	50	270	32.4		2.6	25.4		3.2	17.1		2.4	12.2		2.4	32.2		2.3	28.7		3
Cyanide, Total	mg/kg	27	27	0.13	U	0.13	0.14	U	0.14	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.13	U	0.13
Iron	mg/kg	NA	NA	16900		14.6	29300		17.8	45200		13.1	13000		13	13200		12.9	22900		16.4
Lead	mg/kg	63	400	147		0.52	45.8		0.63	6.9		0.47	5.5		0.46	210		0.46	68.3		0.58
Magnesium	mg/kg	NA	NA	2420		57.7	2260		70.4	1800		52	2060		51.6	1370		51.3	3200		64.9
Manganese	mg/kg	1600	2000	287		0.35	459		0.42	563		0.31	331		0.31	213		0.31	250		0.39
Mercury	mg/kg	0.18	0.81	0.18		0.012	0.06		0.014	0.01	U	0.01	0.0098	U	0.0098	0.81		0.011	0.25		0.014
Nickel	mg/kg	30	310	23.4		0.73	16		0.89	19		0.66	18.2		0.65	11.3		0.65	17.5		0.82
Potassium	mg/kg	NA	NA	1130		61.6	800	J	75.1	892		55.4	1030		55.1	825	J	54.7	1180		69.3
Selenium	mg/kg	3.9	180	2.4	U	2.4	2.9	U	2.9	5.3	U	5.3	2.1	U	2.1	2.1	U	2.1	2.7	U	2.7
Silver	mg/kg	2	180	0.19	U	0.19	0.23	U	0.23	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	0.21	U	0.21
Sodium	mg/kg	NA	NA	79.6	U	79.6	106	J	97.1	71.7	U	71.7	128	J	71.2	70.7	U	70.7	97.1	J	89.5
Thallium	mg/kg	NA	NA	0.63	U	0.63	0.77	U	0.77	0.57	U	0.57	0.57	U	0.57	0.56	U	0.56	0.71	U	0.71
Vanadium	mg/kg	NA	NA	24.5		0.66	40.1		0.8	35.7		0.59	16.3		0.59	17		0.58	28.1		0.74
Zinc	mg/kg	109	NA	191		4.6	90		5.6	51.7		4.2	23.9		4.1	174		4.1	103		5.2

Notes:

SB-14(3-3.5) - Sample ID(Sample

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1E
Summary of Soil/Fill Sampling Results
Metals
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup	SB-15(12.5-13)			SB-15(18-18.5)			SB-16(4-4.5)			SB-16(9.5-10)			SB-16(11.5-12)			SB-16(16-16.5)		
Lab Sample ID				460-182722-15			460-182722-16			460-182722-5			460-182722-6			460-182722-7			460-182722-8		
Sampling Date/Time				05/22/2019 09:55:00			05/22/2019 11:00:00			05/22/2019 08:15:00			05/22/2019 08:20:00			05/22/2019 08:30:00			05/22/2019 08:35:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
METALS																					
Aluminum	mg/kg	NA	NA	5640		10.9	3990		12.9	7720		13.1	4790		13.8	4140		12.7	6690		13.3
Antimony	mg/kg	NA	NA	1	U	1	1.2	U F1	1.2	1.2	U	1.2	1.3	U	1.3	1.2	U	1.2	1.2	U	1.2
Arsenic	mg/kg	13	16	4.6		1.1	3.4		1.3	3.4	J	1.4	3.4	J	1.4	2.9	J	1.3	6.8		1.4
Barium	mg/kg	350	400	131		2.1	36.4	J	2.5	50.2		2.6	34.8	J	2.7	94.7		2.5	225		2.6
Beryllium	mg/kg	7.2	72	0.41		0.086	0.38	J	0.1	0.54		0.1	0.23	J	0.11	0.31	J	0.1	0.42	J	0.1
Cadmium	mg/kg	2.5	4.3	0.18	J	0.13	0.15	U	0.15	0.16	U	0.16	0.17	U	0.17	0.15	U	0.15	0.16	U	0.16
Calcium	mg/kg	NA	NA	8410		56.7	993	J	67.1	1170		68.1	7480		72	3160		66.3	15300		69.3
Chromium	mg/kg	NA	NA	32		0.34	12.2		0.41	19		0.41	10.7		0.44	13.9		0.4	18.2		0.42
Cobalt	mg/kg	NA	NA	7.7	J	1.2	7.2	J	1.4	8.5	J	1.4	3.4	J	1.5	5.7	J	1.4	7.6	J	1.4
Copper	mg/kg	50	270	50.7		2.6	12.7		3	17.3		3.1	16.8		3.3	18.5		3	45.9		3.1
Cyanide, Total	mg/kg	27	27	0.13	U	0.13	0.12	U	0.12	0.12	U	0.12	0.13	U	0.13	0.12	U	0.12	0.12	U	0.12
Iron	mg/kg	NA	NA	16200		14.2	19700		16.7	21900		17	10700		18	21900		16.5	37800		17.3
Lead	mg/kg	63	400	180		0.5	8.8		0.6	8.8		0.6	24.1		0.64	155		0.59	290		0.62
Magnesium	mg/kg	NA	NA	10700		56.2	1900		66.4	2350		67.4	1450		71.3	1550		65.6	2700		68.6
Manganese	mg/kg	1600	2000	317		0.34	723		0.4	598		0.4	206		0.43	645		0.39	622		0.41
Mercury	mg/kg	0.18	0.81	2		0.057	0.011	U	0.011	0.081		0.011	0.097		0.011	0.011	U	0.011	0.043		0.012
Nickel	mg/kg	30	310	90		0.71	27.7		0.84	15.3		0.85	7.4	J	0.9	15		0.83	17.1		0.87
Potassium	mg/kg	NA	NA	606	J	59.9	604	J	70.8	1860		71.9	477	J	76.1	695	J	70	1330		73.2
Selenium	mg/kg	3.9	180	2.3	U	2.3	2.7	U	2.7	2.8	U	2.8	2.9	U	2.9	2.7	U	2.7	2.8	U	2.8
Silver	mg/kg	2	180	0.18	U	0.18	0.22	U	0.22	0.22	U	0.22	0.23	U	0.23	0.21	U	0.21	0.22	U	0.22
Sodium	mg/kg	NA	NA	192	J	77.4	91.5	U	91.5	93	U	93	98.3	U	98.3	90.5	U	90.5	282	J	94.6
Thallium	mg/kg	NA	NA	0.61	U	0.61	0.73	U	0.73	0.74	U	0.74	0.78	U	0.78	0.72	U	0.72	0.75	U	0.75
Vanadium	mg/kg	NA	NA	65.3		0.64	20.9		0.76	30.8		0.77	14.3		0.81	18.5		0.75	29.1		0.78
Zinc	mg/kg	109	NA	216		4.5	30.6		5.3	39.4		5.4	51.5		5.7	94.8		5.2	227		5.5

Notes:

SB-14(3-3.5) - Sample ID(Sample

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1E
Summary of Soil/Fill Sampling Results
Metals
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup	SB-19(2-2.5)			SB-19(6-6.5)			SB-19(13.5-14)			SB-19(17-17.5)			SB-20(4.5-5)			SB-20(6.5-7)		
Lab Sample ID				460-182722-1			460-182722-2			460-182722-3			460-182722-4			460-182722-17			460-182722-18		
Sampling Date/Time				05/22/2019 07:55:00			05/22/2019 08:00:00			05/22/2019 08:05:00			05/22/2019 08:10:00			05/22/2019 11:15:00			05/22/2019 11:20:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
METALS																					
Aluminum	mg/kg	NA	NA	10700		12.7	7530		13.2	12200		12.6	7520		12.8	7080		12.5	6830		14.6
Antimony	mg/kg	NA	NA	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.6	J	1.4
Arsenic	mg/kg	13	16	4.6		1.3	3.2	J	1.4	2.8	J	1.3	3.1	J	1.3	4.2		1.3	13.2		1.5
Barium	mg/kg	350	400	268		2.5	22.1	J	2.6	69.6		2.5	39.8	J	2.5	1630		2.5	2540		2.9
Beryllium	mg/kg	7.2	72	0.38	J	0.1	0.28	J	0.1	0.44	J	0.099	0.38	J	0.1	0.41	J	0.099	0.17	J	0.12
Cadmium	mg/kg	2.5	4.3	0.31	J	0.15	0.16	U	0.16	0.15	U	0.15	0.15	U	0.15	0.15	U	0.15	1.9		0.18
Calcium	mg/kg	NA	NA	9120		66	742	J	68.8	3320		65.8	2300		66.6	2190		65.3	73900		76.1
Chromium	mg/kg	NA	NA	26.1		0.4	12.9		0.42	22.3		0.4	34.6		0.4	15.9		0.39	37.4		0.46
Cobalt	mg/kg	NA	NA	10	J	1.4	6.2	J	1.4	21.8		1.4	6.2	J	1.4	6.1	J	1.4	9	J	1.6
Copper	mg/kg	50	270	35		3	10.2		3.1	42.5		3	15		3	27.2		2.9	63.1		3.4
Cyanide, Total	mg/kg	27	27	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.11	U	0.11	0.9		0.13
Iron	mg/kg	NA	NA	27700		16.5	14500		17.2	31100		16.4	23400		16.6	20700		16.3	40400		19
Lead	mg/kg	63	400	129		0.59	5.4		0.61	5.8		0.58	8.2		0.59	655		0.58	2380		0.68
Magnesium	mg/kg	NA	NA	4600		65.4	2020		68.1	9660		65.2	2070		65.9	1780		64.6	4040		75.4
Manganese	mg/kg	1600	2000	438		0.39	412		0.41	544		0.39	420		0.39	397		0.39	358		0.45
Mercury	mg/kg	0.18	0.81	0.14		0.011	0.011	J	0.011	0.011	U	0.011	0.024		0.012	0.56		0.011	8.2		0.13
Nickel	mg/kg	30	310	26.7		0.82	13.5		0.86	77.3		0.82	14.3		0.83	13.5		0.81	26.3		0.95
Potassium	mg/kg	NA	NA	3550		69.7	593	J	72.6	1090	J	69.5	798	J	70.3	738	J	68.9	2490		80.4
Selenium	mg/kg	3.9	180	2.7	U	2.7	2.8	U	2.8	2.7	U	2.7	2.7	U	2.7	2.6	U	2.6	3.1	U	3.1
Silver	mg/kg	2	180	0.21	U	0.21	0.22	U	0.22	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.24	U	0.24
Sodium	mg/kg	NA	NA	139	J	90.1	93.9	U	93.9	525	J	89.9	90.9	U	90.9	89.1	U	89.1	492	J	104
Thallium	mg/kg	NA	NA	0.72	U	0.72	0.74	U	0.74	0.71	U	0.71	0.72	U	0.72	0.71	U	0.71	0.82	U	0.82
Vanadium	mg/kg	NA	NA	57.3		0.74	18.8		0.78	38.1		0.74	27.3		0.75	21.9		0.74	29.8		0.86
Zinc	mg/kg	109	NA	198		5.2	21.1		5.4	41.1		5.2	28.2		5.3	779		5.2	2570		6

Notes:

SB-14(3-3.5) - Sample ID(Sample

mg/kg - milligrams per kilogram

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Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

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J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

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Table 1E
 Summary of Soil/Fill Sampling Results
 Metals
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup	SB-20(10.5-11)			SB-20(16-16.5)			SB-21 (1-1.5)			SB-21 (7-7.5)			SB-21 (12.5-13)			SB-21 (18-18.5)		
Lab Sample ID				460-182722-19			460-182722-20			460-182616-1			460-182616-2			460-182616-3			460-182616-4		
Sampling Date/Time				05/22/2019 11:25:00			05/22/2019 11:30:00			05/21/2019 13:00:00			05/21/2019 13:10:00			05/21/2019 13:20:00			05/21/2019 13:30:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
METALS																					
Aluminum	mg/kg	NA	NA	7220		12.1	4300		11.2	8180		12.3	6650		12	9950		11.8	3600		11.1
Antimony	mg/kg	NA	NA	1.1	U	1.1	1.1	U	1.1	1.2	U	1.2	1.1	U	1.1	1.1	U	1.1	1	U	1
Arsenic	mg/kg	13	16	3.4		1.2	3.4		1.2	3.3		1.3	3	J	1.2	1.5	J	1.2	1.2	J	1.1
Barium	mg/kg	350	400	374		2.4	214		2.2	166		2.4	55.7		2.4	63.7		2.3	23.4	J	2.2
Beryllium	mg/kg	7.2	72	0.24	J	0.095	0.35	J	0.088	0.46		0.097	0.49		0.095	0.47		0.093	0.27	J	0.087
Cadmium	mg/kg	2.5	4.3	0.15	U	0.15	0.13	U	0.13	0.21	J	0.15	0.14	U	0.14	0.14	U	0.14	0.13	U	0.13
Calcium	mg/kg	NA	NA	8020		62.8	3320		58.4	10200		64.3	1790		62.7	4910		61.7	485	J	57.7
Chromium	mg/kg	NA	NA	19.1		0.38	13.5		0.35	20.5		0.39	21.6		0.38	25		0.37	11.7		0.35
Cobalt	mg/kg	NA	NA	6.6	J	1.3	5.7	J	1.2	7.2	J	1.3	7.6	J	1.3	9.7	J	1.3	3.8	J	1.2
Copper	mg/kg	50	270	14.6		2.8	13.8		2.6	28.7		2.9	17.9		2.8	39		2.8	10.7		2.6
Cyanide, Total	mg/kg	27	27	0.11	U	0.11	0.11	U	0.11	0.12	U	0.12	0.12	U	0.12	0.11	U	0.11	0.11	U	0.11
Iron	mg/kg	NA	NA	19000		15.7	24700		14.6	15300		16	23800		15.6	19700		15.4	14500		14.4
Lead	mg/kg	63	400	185		0.56	72.6		0.52	221		0.57	7.3		0.56	6.5		0.55	3.5		0.51
Magnesium	mg/kg	NA	NA	3270		62.2	1950		57.8	3530		63.6	2570		62	4460		61.1	1250		57.1
Manganese	mg/kg	1600	2000	236		0.37	447		0.35	286		0.38	521		0.37	292		0.37	281		0.34
Mercury	mg/kg	0.18	0.81	0.13		0.0098	0.0098	U	0.0098	0.067		0.011	0.011	U	0.011	0.011	U	0.011	0.0097	U	0.0097
Nickel	mg/kg	30	310	14.7		0.78	13.3		0.73	25.3		0.8	12.2		0.78	21.1		0.77	9.5		0.72
Potassium	mg/kg	NA	NA	2100		66.4	725	J	61.7	2350		67.8	956	J	66.2	1720		65.2	394	J	60.9
Selenium	mg/kg	3.9	180	2.6	U	2.6	2.4	U	2.4	2.6	U	2.6	2.5	U	2.5	2.5	U	2.5	2.3	U	2.3
Silver	mg/kg	2	180	0.2	U	0.2	0.19	U	0.19	0.21	U	0.21	0.2	U	0.2	0.2	U	0.2	0.19	U	0.19
Sodium	mg/kg	NA	NA	133	J	85.8	79.7	U	79.7	99.4	J	87.7	85.6	U	85.6	608	J	84.2	78.7	U	78.7
Thallium	mg/kg	NA	NA	0.68	U	0.68	0.63	U	0.63	0.7	U	0.7	0.68	U	0.68	0.67	U	0.67	0.62	U	0.62
Vanadium	mg/kg	NA	NA	23.6		0.71	25.1		0.66	32.9		0.72	30		0.71	39.8		0.7	18.3		0.65
Zinc	mg/kg	109	NA	193		5	94.4		4.6	155		5.1	28.8		5	33		4.9	21.6		4.6

Notes:

SB-14(3-3.5) - Sample ID(Sample

mg/kg - milligrams per kilogram

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Detected above the Restricted Residential SCO

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J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

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Table 1E
Summary of Soil/Fill Sampling Results
Metals
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup	SB-22 (3.5-4)			SB-22 (6-6.5)			SB-22 (14-14.5)			SB-22 (16.5-17)			SB-23 (4-4.5)			SB-23 (6.5-7)		
Lab Sample ID				460-182616-5			460-182616-6			460-182616-7			460-182616-8			460-182440-1			460-182440-2		
Sampling Date/Time				05/21/2019 13:45:00			05/21/2019 13:50:00			05/21/2019 14:00:00			05/21/2019 14:05:00			05/20/2019 09:00:00			05/20/2019 09:05:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil		
Analyte				Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
METALS																					
Aluminum	mg/kg	NA	NA	7600		13.4	14800		11.8	6830		11.9	3600		11.4	6490		8.4	1490		12.2
Antimony	mg/kg	NA	NA	1.3	U	1.3	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	0.94	J F1	0.78	2.2	J	1.1
Arsenic	mg/kg	13	16	3.5	J	1.4	3.3		1.2	2.3	J	1.2	1.6	J	1.2	9.1		0.87	4.8		1.3
Barium	mg/kg	350	400	336		2.6	45.7		2.3	37.6	J	2.3	22.8	J	2.2	479	F1	1.6	109		2.4
Beryllium	mg/kg	7.2	72	0.42	J	0.11	0.55		0.093	0.52		0.094	0.34	J	0.089	0.39		0.066	0.096	U	0.096
Cadmium	mg/kg	2.5	4.3	0.77	J	0.16	0.14	U	0.14	0.14	U	0.14	0.14	U	0.14	0.54	J	0.1	4.2		0.15
Calcium	mg/kg	NA	NA	8950		69.7	1200		61.6	900	J	61.9	743	J	59.2	28000		43.6	157000		317
Chromium	mg/kg	NA	NA	19.9		0.42	23.2		0.37	17		0.37	11.2		0.36	25.4		0.26	133		0.38
Cobalt	mg/kg	NA	NA	6.8	J	1.5	5.9	J	1.3	7.1	J	1.3	4.8	J	1.2	6.6	J	0.91	5.9	J	1.3
Copper	mg/kg	50	270	37.7		3.1	10.9		2.8	15.4		2.8	10.5		2.7	41.9	F1	2	176		2.9
Cyanide, Total	mg/kg	27	27	0.16	J	0.13	0.12	U	0.12	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.4		0.11
Iron	mg/kg	NA	NA	19600		17.4	18200		15.4	19200		15.5	15500		14.8	60000		27.2	17600		15.8
Lead	mg/kg	63	400	568		0.62	8.7		0.55	6.4		0.55	4.5		0.53	701		0.39	5170		0.56
Magnesium	mg/kg	NA	NA	2070		69	2300		60.9	1750		61.3	1370		58.6	2640		43.1	1880		62.7
Manganese	mg/kg	1600	2000	411		0.41	200		0.36	419		0.37	384		0.35	509		0.26	146		0.38
Mercury	mg/kg	0.18	0.81	0.16		0.011	0.012	U	0.012	0.011	U	0.011	0.0095	U	0.0095	0.01	U	0.01	0.2		0.0097
Nickel	mg/kg	30	310	13.9		0.87	13.9		0.77	11.5		0.77	10.9		0.74	22.3		0.54	36.8		0.79
Potassium	mg/kg	NA	NA	675	J	73.7	601	J	65	848	J	65.4	515	J	62.5	769		46	283	J	66.9
Selenium	mg/kg	3.9	180	2.8	U	2.8	2.5	U	2.5	2.5	U	2.5	2.4	U	2.4	1.8	U	1.8	2.6	U	2.6
Silver	mg/kg	2	180	0.22	U	0.22	0.2	U	0.2	0.2	U	0.2	0.19	U	0.19	0.14	U	0.14	0.2	U	0.2
Sodium	mg/kg	NA	NA	144	J	95.2	84	U	84	84.5	U	84.5	80.8	U	80.8	224	J	59.5	147	J	86.5
Thallium	mg/kg	NA	NA	0.76	U	0.76	0.67	U	0.67	0.67	U	0.67	0.64	U	0.64	1.4	J	0.47	1	J	0.69
Vanadium	mg/kg	NA	NA	30.6		0.79	33.2		0.69	27.9		0.7	19.4		0.67	19.3		0.49	7.1	J	0.71
Zinc	mg/kg	109	NA	371		5.5	26.6		4.9	26		4.9	18.6		4.7	344		3.4	4310		25.1

Notes:

SB-14(3-3.5) - Sample ID(Sample

mg/kg - milligrams per kilogram

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Table 1E
Summary of Soil/Fill Sampling Results
Metals
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup	SB-23 (12.5-13.0)			SB-23 (19-19.5)			SB-29 (3-3.5)			SB-29 (7-7.5)			SB-29 (14.5-15)			SB-29 (18-18.5)		
Lab Sample ID				460-182440-3			460-182440-4			460-182440-5			460-182440-6			460-182440-7			460-182440-8		
Sampling Date/Time				05/20/2019 09:10:00			05/20/2019 09:15:00			05/20/2019 10:00:00			05/20/2019 10:05:00			05/20/2019 10:10:00			05/20/2019 10:15:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
METALS																					
Aluminum	mg/kg	NA	NA	4870		9.4	3820		9.7	9110		10.7	9210		9.5	7600		10	4900		9.9
Antimony	mg/kg	NA	NA	0.88	U	0.88	0.91	U	0.91	1	U	1	0.89	U	0.89	2.4	J	0.94	0.93	U	0.93
Arsenic	mg/kg	13	16	1.7	J	0.97	1	U	1	4.5		1.1	2.4	J	0.98	15.5		1	1.4	J	1
Barium	mg/kg	350	400	29.2	J	1.8	25.3	J	1.9	188		2.1	80.5		1.9	285		2	40.5		1.9
Beryllium	mg/kg	7.2	72	0.38		0.074	0.3	J	0.076	0.45		0.084	0.45		0.075	0.41		0.079	0.42		0.078
Cadmium	mg/kg	2.5	4.3	0.11	U	0.11	0.12	U	0.12	0.82		0.13	0.11	U	0.11	0.37	J	0.12	0.12	U	0.12
Calcium	mg/kg	NA	NA	2450		48.8	663	J	50.4	5610		55.8	1400		49.4	7730		52.1	909		51.6
Chromium	mg/kg	NA	NA	13.4		0.29	9.7		0.3	19.6		0.34	16		0.3	30.8		0.31	12.6		0.31
Cobalt	mg/kg	NA	NA	4.9	J	1	4.4	J	1.1	5.6	J	1.2	4.9	J	1	7.9	J	1.1	6	J	1.1
Copper	mg/kg	50	270	15.8		2.2	8.2		2.3	53.7		2.5	13.8		2.2	41.9		2.4	13.9		2.3
Cyanide, Total	mg/kg	27	27	0.88		0.13	0.1	U	0.1	0.11	U	0.11	0.24	J	0.12	0.11	U	0.11	0.15	J	0.11
Iron	mg/kg	NA	NA	18400		12.2	15700		12.6	18300		13.9	16800		12.3	58600		13	19300		12.9
Lead	mg/kg	63	400	52.6		0.43	5.1		0.45	240		0.5	52.5		0.44	488		0.46	5.1		0.46
Magnesium	mg/kg	NA	NA	2430		48.3	1590		49.9	1990		55.2	2080		48.9	1990		51.6	2240		51.1
Manganese	mg/kg	1600	2000	404		0.29	370		0.3	338		0.33	281		0.29	573		0.31	576		0.31
Mercury	mg/kg	0.18	0.81	1.7		0.04	0.011	U	0.011	0.011	U	0.011	0.72		0.011	0.043		0.011	0.18		0.011
Nickel	mg/kg	30	310	19.2		0.61	12.6		0.63	15.1		0.7	12.1		0.62	21.5		0.65	24.9		0.64
Potassium	mg/kg	NA	NA	990		51.5	681	J	53.3	764	J	58.9	764	J	52.2	878	J	55	900		54.5
Selenium	mg/kg	3.9	180	2	U	2	2	U	2	2.3	U	2.3	2	U	2	2.1	U	2.1	2.1	U	2.1
Silver	mg/kg	2	180	0.16	U	0.16	0.16	U	0.16	0.18	U	0.18	0.16	U	0.16	0.17	U	0.17	0.17	U	0.17
Sodium	mg/kg	NA	NA	88	J	66.6	68.9	U	68.9	78.1	J	76.2	67.5	U	67.5	254	J	71.1	70.5	U	70.5
Thallium	mg/kg	NA	NA	0.53	U	0.53	0.55	U	0.55	0.6	U	0.6	0.54	U	0.54	1.2	J	0.56	0.56	U	0.56
Vanadium	mg/kg	NA	NA	19.1		0.55	15.5		0.57	26.3		0.63	22		0.56	27.8		0.59	20.1		0.58
Zinc	mg/kg	109	NA	64.6		3.9	22.5		4	297		4.4	41.4		3.9	205		4.1	22.6		4.1

Notes:

SB-14(3-3.5) - Sample ID(Sample

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1E
Summary of Soil/Fill Sampling Results
Metals
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup	SB-30 (2-2.5)			SB-30 (8.5-9.0)			SB-30 (16.5-17.0)			SB-30 (13-13.5)			SB-31 (1-1.5)			SB-31 (9-9.5)		
Lab Sample ID				460-182440-9			460-182440-10			460-182440-11			460-182440-12			460-182440-13			460-182440-14		
Sampling Date/Time				05/20/2019 09:20:00			05/20/2019 09:25:00			05/20/2019 09:35:00			05/20/2019 09:30:00			05/20/2019 09:40:00			05/20/2019 09:45:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
METALS																					
Aluminum	mg/kg	NA	NA	9950		9.8	9290		10.9	2950		8.8	2860		9.2	7420		9.5	3490		10.7
Antimony	mg/kg	NA	NA	0.92	U	0.92	1	U	1	0.82	U	0.82	0.86	U	0.86	0.89	U	0.89	1.4	J	1
Arsenic	mg/kg	13	16	3.9		1	3.4		1.1	1	J	0.91	0.95	U	0.95	2.7		0.98	11.6		1.1
Barium	mg/kg	350	400	548		1.9	208		2.1	38.3		1.7	24.4	J	1.8	82.3		1.9	892		2.1
Beryllium	mg/kg	7.2	72	0.59		0.077	0.55		0.086	0.25	J	0.069	0.21	J	0.072	0.53		0.075	0.24	J	0.084
Cadmium	mg/kg	2.5	4.3	0.72		0.12	0.24	J	0.13	0.11	U	0.11	0.11	U	0.11	0.14	J	0.11	1.6		0.13
Calcium	mg/kg	NA	NA	10500		51.1	7020		56.9	1860		45.8	841		47.7	14500		49.3	76600		55.6
Chromium	mg/kg	NA	NA	23.2		0.31	24.5		0.34	7.3		0.28	6.5		0.29	23.1		0.3	19.5		0.34
Cobalt	mg/kg	NA	NA	7.8	J	1.1	6.5	J	1.2	3.3	J	0.96	2.9	J	1	6.4	J	1	5.9	J	1.2
Copper	mg/kg	50	270	36		2.3	22.2		2.6	8.2		2.1	7.5		2.2	23.3		2.2	38200		25.1
Cyanide, Total	mg/kg	27	27	0.11	U	0.11	0.12	J	0.11	0.12	U	0.12	0.1	U	0.1	0.11	U	0.11	0.11	U	0.11
Iron	mg/kg	NA	NA	21100		12.7	20700		14.2	11400		11.4	11100		11.9	29900		12.3	37300		13.9
Lead	mg/kg	63	400	1500		0.45	872		0.51	27		0.41	2.7		0.42	79.3		0.44	3490		0.49
Magnesium	mg/kg	NA	NA	4830		50.6	2620		56.3	1300		45.3	1160		47.3	2350		48.8	3400		55.1
Manganese	mg/kg	1600	2000	323		0.3	440		0.34	335		0.27	261		0.28	598		0.29	394		0.33
Mercury	mg/kg	0.18	0.81	0.01	U	0.01	0.12		0.01	0.25		0.011	0.03		0.011	0.039		0.011	0.12		0.011
Nickel	mg/kg	30	310	22.6		0.64	17.8		0.71	10.1		0.57	9		0.6	14.5		0.62	13.4		0.69
Potassium	mg/kg	NA	NA	3640		53.9	974		60.1	538	J	48.3	496	J	50.4	995		52.1	516	J	58.8
Selenium	mg/kg	3.9	180	2.1	U	2.1	2.3	U	2.3	1.9	U	1.9	1.9	U	1.9	2	U	2	2.3	U	2.3
Silver	mg/kg	2	180	0.16	U	0.16	0.18	U	0.18	0.15	U	0.15	0.15	U	0.15	0.16	U	0.16	0.82	J	0.18
Sodium	mg/kg	NA	NA	136	J	69.7	95.8	J	77.7	62.5	U	62.5	65.2	U	65.2	205	J	67.3	190	J	76
Thallium	mg/kg	NA	NA	0.55	U	0.55	0.62	U	0.62	0.5	U	0.5	0.52	U	0.52	0.53	U	0.53	1	J	0.6
Vanadium	mg/kg	NA	NA	44.3		0.58	32.7		0.64	11.6		0.52	11.3		0.54	31.8		0.56	14.4		0.63
Zinc	mg/kg	109	NA	234		4	139		4.5	29.4		3.6	13.8		3.8	72		3.9	2020		4.4

Notes:

SB-14(3-3.5) - Sample ID(Sample

mg/kg - milligrams per kilogram

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BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

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J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

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Table 1E
 Summary of Soil/Fill Sampling Results
 Metals
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup	SB-31 (11-11.5)			SB-31 (16.5-17)			SB-32 (4-4.5)			SB-32 (7-7.5)			SB-32 (14.5-15)			SB-32 (18-18.5)		
Lab Sample ID				460-182440-15			460-182440-16			460-182440-17			460-182440-18			460-182440-19			460-182440-20		
Sampling Date/Time				05/20/2019 09:50:00			05/20/2019 09:55:00			05/20/2019 10:20:00			05/20/2019 10:22:00			05/20/2019 10:25:00			05/20/2019 10:30:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
METALS																					
Aluminum	mg/kg	NA	NA	5630		9.5	6040		9.5	7280		10.5	7130		9.5	3690		9.5	5210		9.6
Antimony	mg/kg	NA	NA	0.89	U	0.89	95.9		0.89	1.9	J	0.98	0.89	U	0.89	0.89	F1	0.89	0.9	U	0.9
Arsenic	mg/kg	13	16	2.6		0.98	8.7		0.98	3.1		1.1	4.5		0.98	0.98	U	0.98	1.5	J	0.99
Barium	mg/kg	350	400	124		1.9	524		1.9	201		2.1	165		1.9	36.2		1.9	40.7		1.9
Beryllium	mg/kg	7.2	72	0.41		0.074	0.34		0.075	0.45		0.083	0.48		0.074	0.33	J	0.075	0.38		0.075
Cadmium	mg/kg	2.5	4.3	0.64	J	0.11	11.6		0.11	0.73	J	0.13	0.51	J	0.11	0.11	U	0.11	0.12	U	0.12
Calcium	mg/kg	NA	NA	13300		49.3	36500		49.4	7680		54.7	8280		49.3	1330	F1	49.4	1580		49.9
Chromium	mg/kg	NA	NA	11.8		0.3	18.2		0.3	18		0.33	26.2		0.3	12.1		0.3	28.3		0.3
Cobalt	mg/kg	NA	NA	6.3	J	1	5	J	1	6.5	J	1.1	6.2	J	1	3.9	J	1	4.8	J	1
Copper	mg/kg	50	270	184		2.2	82.2		2.2	66.9		2.5	42.9		2.2	13.9		2.2	15		2.3
Cyanide, Total	mg/kg	27	27	0.87		0.12	0.11	U	0.11	0.39		0.12	0.13	U	0.13	0.16	J	0.12	0.11	U	0.11
Iron	mg/kg	NA	NA	20900		12.3	38400		12.3	16900		13.6	22800		12.3	16100		12.3	20800		12.4
Lead	mg/kg	63	400	123		0.44	20800		2.2	456		0.49	186		0.44	17.9	F1	0.44	18.3		0.44
Magnesium	mg/kg	NA	NA	2370		48.8	2850		48.9	3090		54.1	2880		48.8	1760		48.9	2700		49.3
Manganese	mg/kg	1600	2000	361		0.29	384		0.29	335		0.32	363		0.29	316		0.29	403		0.3
Mercury	mg/kg	0.18	0.81	0.79		0.011	0.039		0.01	0.38		0.032	0.23		0.012	0.16		0.011	0.017	J	0.011
Nickel	mg/kg	30	310	15.6		0.62	13.1		0.62	27.7		0.68	20		0.61	10.9		0.62	17.3		0.62
Potassium	mg/kg	NA	NA	1600		52.1	913		52.2	1350		57.7	1180		52	592	J	52.2	1290		52.6
Selenium	mg/kg	3.9	180	2	U	2	2	U	2	2.2	U	2.2	2	U	2	2	U	2	2	U	2
Silver	mg/kg	2	180	0.16	U	0.16	0.28	J	0.16	0.18	U	0.18	0.16	U	0.16	0.16	U	0.16	0.16	U	0.16
Sodium	mg/kg	NA	NA	96.6	J	67.3	363	J	67.5	126	J	74.6	147	J	67.2	69.1	J	67.4	76.6	J	68
Thallium	mg/kg	NA	NA	0.53	U	0.53	0.59	J	0.54	0.59	U	0.59	0.53	U	0.53	0.58	J	0.54	0.54	U	0.54
Vanadium	mg/kg	NA	NA	21.6		0.56	21.7		0.56	27		0.62	28.4		0.56	14.3		0.56	19.2		0.56
Zinc	mg/kg	109	NA	236		3.9	2980		19.6	281		4.3	209		3.9	31.3	F1	3.9	33.9		3.9

Notes:

SB-14(3-3.5) - Sample ID(Sample

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

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Table 1E
 Summary of Soil/Fill Sampling Results
 Metals
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup	SB-33 (3.5-4.0)			SB-33 (7.5-8.0)			SB-33 (11.5-12)			SB-33 (17.0-17.5)			SB-34 (1.5-2.0)			SB-34 (9-9.5)		
Lab Sample ID				460-182440-21			460-182440-22			460-182440-23			460-182440-24			460-182440-25			460-182440-26		
Sampling Date/Time				05/20/2019 10:35:00			05/20/2019 10:40:00			05/20/2019 10:45:00			05/20/2019 10:50:00			05/20/2019 12:00:00			05/20/2019 12:05:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil		
Analyte				Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
METALS																					
Aluminum	mg/kg	NA	NA	5510		9.2	3450		9.4	4170		9.3	3920		9.5	8020		9.3	3540		9
Antimony	mg/kg	NA	NA	0.86	U	0.86	0.88	U	0.88	0.87	U	0.87	0.89	U	0.89	0.87	U	0.87	0.84	U	0.84
Arsenic	mg/kg	13	16	1.5	J	0.95	0.97	U	0.97	1.4	J	0.96	1.2	J	0.98	6.5		0.96	1.4	J	0.93
Barium	mg/kg	350	400	27.9	J	1.8	22.4	J	1.8	24.8	J	1.8	26.3	J	1.9	345		1.8	26.5	J	1.8
Beryllium	mg/kg	7.2	72	0.33		0.073	0.33		0.074	0.31	J	0.073	0.37		0.075	0.43		0.073	0.27	J	0.071
Cadmium	mg/kg	2.5	4.3	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.9		0.11	0.11	U	0.11
Calcium	mg/kg	NA	NA	603	J	48	402	J	49	17600		48.3	2120		49.4	20800		48.4	764	J	46.7
Chromium	mg/kg	NA	NA	12		0.29	9.5		0.3	15.1		0.29	14.4		0.3	18.1		0.29	7.9		0.28
Cobalt	mg/kg	NA	NA	3.9	J	1	4.5	J	1	4.1	J	1	3.8	J	1	6.1	J	1	3.4	J	0.97
Copper	mg/kg	50	270	13.2		2.2	9.2		2.2	9.5		2.2	8.9		2.2	38.3		2.2	10.6		2.1
Cyanide, Total	mg/kg	27	27	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.1	U	0.1	0.1	U	0.1	0.13	J	0.12
Iron	mg/kg	NA	NA	14200		12	19400		12.2	14000		12.1	19500		12.3	18800		12.1	13600		11.6
Lead	mg/kg	63	400	3.2		0.43	4.1		0.43	6.5		0.43	4.5		0.44	307		0.43	13.1		0.41
Magnesium	mg/kg	NA	NA	1040		47.5	1290		48.5	1950		47.8	1310		48.9	2530		47.9	1510		46.2
Manganese	mg/kg	1600	2000	274		0.28	443		0.29	308		0.29	418		0.29	389		0.29	356		0.28
Mercury	mg/kg	0.18	0.81	0.035		0.011	0.01	U	0.01	0.01	U	0.01	0.0099	U	0.0099	0.01	U	0.01	1.4		0.032
Nickel	mg/kg	30	310	8.6		0.6	9.1		0.61	13.2		0.6	11.4		0.62	14.4		0.6	12.5		0.58
Potassium	mg/kg	NA	NA	393	J	50.7	431	J	51.7	611	J	51	474	J	52.2	669	J	51.1	621	J	49.3
Selenium	mg/kg	3.9	180	1.9	U	1.9	2	U	2	2	U	2	2	U	2	2	U	2	1.9	U	1.9
Silver	mg/kg	2	180	0.15	U	0.15	0.16	U	0.16	0.16	U	0.16	0.16	U	0.16	0.22	J	0.16	0.15	U	0.15
Sodium	mg/kg	NA	NA	65.5	U	65.5	66.8	U	66.8	67.1	J	66	67.4	U	67.4	66.3	J	66	63.7	U	63.7
Thallium	mg/kg	NA	NA	0.52	U	0.52	0.53	U	0.53	0.53	J	0.52	0.54	U	0.54	0.52	U	0.52	0.51	U	0.51
Vanadium	mg/kg	NA	NA	16.4		0.54	16.1		0.55	16		0.54	17.1		0.56	21.5		0.55	17.4		0.53
Zinc	mg/kg	109	NA	16.5		3.8	18.7		3.9	23.2		3.8	21.4		3.9	345		3.8	29.5		3.7

Notes:

SB-14(3-3.5) - Sample ID(Sample

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

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Detected above the Restricted Residential SCO

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Table 1E
 Summary of Soil/Fill Sampling Results
 Metals
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup	SB-34 (13-13.5)			SB-34 (15.5-16.0)			SB-35 (4.5-5.0)			SB-35 (19-19.5)			SB-35 (8-8.5)			SB-35 (13.5-14.0)		
Lab Sample ID				460-182440-27			460-182440-28			460-182440-29			460-182440-30			460-182440-31			460-182440-32		
Sampling Date/Time				05/20/2019 12:10:00			05/20/2019 12:15:00			05/20/2019 12:20:00			05/20/2019 12:35:00			05/20/2019 12:25:00			05/20/2019 12:30:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
METALS																					
Aluminum	mg/kg	NA	NA	2760		9.8	4500		8.9	11200		10.1	2970		8.6	4240		9.5	3760		8.8
Antimony	mg/kg	NA	NA	0.92	U	0.92	0.84	U	0.84	0.95	U	0.95	0.81	U	0.81	0.89	U	0.89	0.83	U	0.83
Arsenic	mg/kg	13	16	1	U	1	1.3	J	0.92	5.4		1	1.1	J	0.89	1.6	J	0.99	0.91	U	0.91
Barium	mg/kg	350	400	20.8	J	1.9	37.1		1.7	203		2	23.6	J	1.7	43.3		1.9	25.3	J	1.7
Beryllium	mg/kg	7.2	72	0.25	J	0.077	0.34		0.07	0.58		0.08	0.25	J	0.068	0.39		0.075	0.26	J	0.07
Cadmium	mg/kg	2.5	4.3	0.12	U	0.12	0.11	U	0.11	0.29	J	0.12	0.1	U	0.1	0.11	U	0.11	0.11	U	0.11
Calcium	mg/kg	NA	NA	858	J	51.1	4360		46.4	6330		52.8	1350		44.9	4520		49.6	1480		46
Chromium	mg/kg	NA	NA	6.6		0.31	17.2		0.28	26.6		0.32	6.9		0.27	11.1		0.3	10		0.28
Cobalt	mg/kg	NA	NA	3.6	J	1.1	4.1	J	0.97	6	J	1.1	3.6	J	0.94	6.2	J	1	3.7	J	0.96
Copper	mg/kg	50	270	8.2		2.3	11.7		2.1	32.4		2.4	10.8		2	13.6		2.2	22.6		2.1
Cyanide, Total	mg/kg	27	27	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.35		0.13	0.11	U	0.11	0.11	U	0.11
Iron	mg/kg	NA	NA	12800		12.8	17600		11.6	22200		13.2	12800		11.2	21200		12.4	14000		11.5
Lead	mg/kg	63	400	2.9		0.45	13.8		0.41	511		0.47	4.9		0.4	35.1		0.44	9.5		0.41
Magnesium	mg/kg	NA	NA	1160		50.6	2240		46	2350		52.2	2160		44.5	2250		49.1	1730		45.6
Manganese	mg/kg	1600	2000	339		0.3	373		0.28	440		0.31	275		0.27	847		0.29	250		0.27
Mercury	mg/kg	0.18	0.81	0.071		0.0094	0.011	U	0.011	0.035		0.01	0.38		0.011	0.01	U	0.01	0.096		0.01
Nickel	mg/kg	30	310	9.5		0.64	15.9		0.58	14.9		0.66	16		0.56	14.5		0.62	13.8		0.57
Potassium	mg/kg	NA	NA	495	J	54	1010		49	607	J	55.7	606	J	47.4	798	J	52.4	539	J	48.6
Selenium	mg/kg	3.9	180	2.1	U	2.1	1.9	U	1.9	2.1	U	2.1	1.8	U	1.8	2	U	2	1.9	U	1.9
Silver	mg/kg	2	180	0.16	U	0.16	0.15	U	0.15	0.17	U	0.17	0.14	U	0.14	0.16	U	0.16	0.15	U	0.15
Sodium	mg/kg	NA	NA	69.8	U	69.8	134	J	63.4	72.6	J	72	118	J	61.3	67.7	U	67.7	146	J	62.8
Thallium	mg/kg	NA	NA	0.55	U	0.55	0.5	U	0.5	0.57	U	0.57	0.49	U	0.49	0.9	J	0.54	0.62	J	0.5
Vanadium	mg/kg	NA	NA	13.1		0.58	17.8		0.52	32.9		0.59	12.9		0.51	17.4		0.56	13.8		0.52
Zinc	mg/kg	109	NA	14.4		4	30.8		3.7	203		4.2	16.6		3.6	58.3		3.9	20.9		3.6

Notes:

SB-14(3-3.5) - Sample ID(Sample

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1E
 Summary of Soil/Fill Sampling Results
 Metals
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup	SB-36 (2-2.5)			SB-36 (6-6.5)			SB-36 (13-13.5)			SB-36 (17-17.5)			TP-5(4.5-5.0)			TP-5(9.5-10.0)		
Lab Sample ID				460-182440-33			460-182440-34			460-182440-35			460-182440-36			460-182779-1			460-182779-2		
Sampling Date/Time				05/20/2019 12:40:00			05/20/2019 12:45:00			05/20/2019 12:50:00			05/20/2019 12:55:00			05/23/2019 12:20:00			05/23/2019 12:35:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil		
Analyte				Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
METALS																					
Aluminum	mg/kg	NA	NA	9000		10.4	5650		9.6	10600		9.7	3050		9.4	7260		9.2	6180		10.1
Antimony	mg/kg	NA	NA	0.97	U	0.97	0.9	U	0.9	0.91	U	0.91	0.89	U	0.89	0.87	J	0.87	0.94	U	0.94
Arsenic	mg/kg	13	16	3.2		1.1	2.6		0.99	4.7		1	0.98	U	0.98	4.3		0.96	6.6		1
Barium	mg/kg	350	400	64.2		2	198		1.9	112		1.9	23.5	J	1.9	143		1.8	757		2
Beryllium	mg/kg	7.2	72	0.53		0.082	0.35		0.076	0.51		0.076	0.28	J	0.074	0.55		0.073	0.45		0.079
Cadmium	mg/kg	2.5	4.3	0.18	J	0.12	0.24	J	0.12	0.14	J	0.12	0.11	U	0.11	0.38	J	0.11	0.9		0.12
Calcium	mg/kg	NA	NA	11400		54	24700		50	2310		50.4	872		49.2	12000		48.1	34000		52.4
Chromium	mg/kg	NA	NA	17.9		0.33	15.6		0.3	18.8		0.3	8		0.3	15.9		0.29	17.8		0.32
Cobalt	mg/kg	NA	NA	7.1	J	1.1	4.6	J	1	6.5	J	1.1	4.3	J	1	7	J	1	5.8	J	1.1
Copper	mg/kg	50	270	21.7		2.4	26.2		2.3	32.2		2.3	8		2.2	31.1		2.2	32.6		2.4
Cyanide, Total	mg/kg	27	27	0.1	U	0.1	0.13	U	0.13	0.14	J	0.11	0.12	U	0.12	0.11	U	0.11	0.43		0.12
Iron	mg/kg	NA	NA	24300		13.5	15900		12.5	19800		12.6	15400		12.3	19500		12	19500		13.1
Lead	mg/kg	63	400	45.9		0.48	255		0.44	339		0.45	5.1		0.44	156		0.43	891		0.47
Magnesium	mg/kg	NA	NA	3650		53.4	2540		49.5	2130		49.9	1410		48.7	2870		47.6	2910		51.9
Manganese	mg/kg	1600	2000	383		0.32	441		0.3	394		0.3	357		0.29	442		0.28	401		0.31
Mercury	mg/kg	0.18	0.81	0.0094	J	0.0093	0.22		0.011	0.15		0.011	0.15		0.01	0.52		0.011	0.42		0.011
Nickel	mg/kg	30	310	20.1		0.67	15.5		0.62	14.9		0.63	9.1		0.61	15.7		0.6	12.8		0.65
Potassium	mg/kg	NA	NA	2530		57	934		52.8	1020		53.2	743	J	52	1470		50.8	1040		55.4
Selenium	mg/kg	3.9	180	2.2	U	2.2	2	U	2	2	U	2	2	U	2	2	U	2	2.1	U	2.1
Silver	mg/kg	2	180	0.17	U	0.17	0.16	U	0.16	0.16	U	0.16	0.16	U	0.16	0.15	U	0.15	0.17	U	0.17
Sodium	mg/kg	NA	NA	127	J	73.7	143	J	68.3	68.8	U	68.8	67.2	U	67.2	153	J	65.6	207	J	71.6
Thallium	mg/kg	NA	NA	0.58	U	0.58	0.58	J	0.54	0.55	U	0.55	0.53	U	0.53	0.52	U	0.52	0.57	U	0.57
Vanadium	mg/kg	NA	NA	26.8		0.61	19.6		0.56	26.8		0.57	14.3		0.55	26.9		0.54	27.5		0.59
Zinc	mg/kg	109	NA	171		4.3	141		4	106		4	22.9		3.9	153		3.8	483		4.1

Notes:

SB-14(3-3.5) - Sample ID(Sample

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1E
Summary of Soil/Fill Sampling Results
Metals
1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup	TP-5(12-12.5)			TP-6(4.5-5.0)			TP-6(9-9.5)			TP-6(11-11.5)			TP-7(4.5-5.0)			TP-7(8-8.5)		
Lab Sample ID				460-182779-3			460-182779-4			460-182779-5			460-182779-6			460-182779-7			460-182779-8		
Sampling Date/Time				05/23/2019 12:45:00			05/23/2019 14:30:00			05/23/2019 14:35:00			05/23/2019 14:45:00			05/23/2019 12:55:00			05/23/2019 13:05:00		
Sample Matrix				Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
METALS																					
Aluminum	mg/kg	NA	NA	5120		9.1	3630		8.9	7240		10.4	9360		10.7	6450		10.4	5890		12.1
Antimony	mg/kg	NA	NA	0.85	U	0.85	1.1	J	0.84	1.6	J	0.98	1	U	1	1.2	J	0.98	3.3	J	1.1
Arsenic	mg/kg	13	16	2.4		0.94	4.9		0.92	5.6		1.1	3.4		1.1	5.5		1.1	10.8		1.3
Barium	mg/kg	350	400	125		1.8	605		1.8	347		2	37.1	J	2.1	74.3		2.1	394		2.4
Beryllium	mg/kg	7.2	72	0.35		0.071	0.24	J	0.07	0.53		0.082	0.61		0.084	0.5		0.082	0.38	J	0.095
Cadmium	mg/kg	2.5	4.3	0.28	J	0.11	1.1		0.11	1		0.13	0.13	U	0.13	0.48	J	0.13	1.2		0.15
Calcium	mg/kg	NA	NA	2260		47.3	35600		46.5	12200		54.3	971		55.8	5910		54.4	29900		63
Chromium	mg/kg	NA	NA	12		0.29	13.4		0.28	20.1		0.33	16.6		0.34	23.2		0.33	20.3		0.38
Cobalt	mg/kg	NA	NA	4.4	J	0.99	3.8	J	0.97	6.9	J	1.1	6.3	J	1.2	5.5	J	1.1	6	J	1.3
Copper	mg/kg	50	270	9.5		2.1	29.9		2.1	56.9		2.5	13.8		2.5	22.4		2.5	36.2		2.8
Cyanide, Total	mg/kg	27	27	0.11	U	0.11	0.39		0.094	0.28		0.11	0.11	U	0.11	0.12	U	0.12	0.2	J	0.15
Iron	mg/kg	NA	NA	17300		11.8	15800		11.6	22200		13.6	17900		13.9	28700		13.6	70900		15.7
Lead	mg/kg	63	400	42.3		0.42	1020		0.41	486		0.48	7.2		0.5	79.3		0.48	685		0.56
Magnesium	mg/kg	NA	NA	1640		46.8	2140		46	2730		53.8	2440		55.2	2120		53.9	2570		62.3
Manganese	mg/kg	1600	2000	347		0.28	219		0.28	391		0.32	238		0.33	297		0.32	453		0.37
Mercury	mg/kg	0.18	0.81	0.029		0.0096	0.48		0.0093	0.93		0.012	0.021		0.011	0.18		0.011	0.37		0.014
Nickel	mg/kg	30	310	8.6		0.59	8.5		0.58	19.9		0.68	13.8		0.7	12.9		0.68	30.4		0.79
Potassium	mg/kg	NA	NA	436	J	50	544	J	49.1	1430		57.4	1100		58.9	859	J	57.5	874	J	66.5
Selenium	mg/kg	3.9	180	1.9	U	1.9	1.9	U	1.9	2.2	U	2.2	2.3	U	2.3	2.2	U	2.2	12.8	U	12.8
Silver	mg/kg	2	180	0.5	J	0.15	0.15	U	0.15	0.17	U	0.17	0.18	U	0.18	0.17	U	0.17	0.2	U	0.2
Sodium	mg/kg	NA	NA	64.6	U	64.6	117	J	63.5	104	J	74.1	76.2	U	76.2	92	J	74.3	257	J	85.9
Thallium	mg/kg	NA	NA	0.51	U	0.51	0.5	U	0.5	0.59	U	0.59	0.6	U	0.6	0.59	U	0.59	1.2	J	0.68
Vanadium	mg/kg	NA	NA	17.6		0.53	16.5		0.52	33.6		0.61	25.8		0.63	23.3		0.61	22		0.71
Zinc	mg/kg	109	NA	102		3.7	822		3.7	436		4.3	34.1		4.4	71.9		4.3	614		5

Notes:

SB-14(3-3.5) - Sample ID(Sample

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1E
 Summary of Soil/Fill Sampling Results
 Metals
 1510 Broadway, Brooklyn, NY

Sample ID	Units	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup	TP-7(10-10.5)			DUP-1			DUP-2			DUP-3		
Lab Sample ID				460-182779-9			460-182440-37			460-182616-9			460-182722-21		
Sampling Date/Time				05/23/2019 13:15:00			05/20/2019 00:00:00			05/21/2019 00:00:00			05/22/2019 00:00:00		
Sample Matrix				Soil			Soil			Soil			Soil		
Analyte	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
METALS															
Aluminum	mg/kg	NA	NA	6500		11.4	2850		8.5	4600		12.4	3390		12.8
Antimony	mg/kg	NA	NA	1.1	U	1.1	0.8	U	0.8	1.2	U	1.2	1.2	U	1.2
Arsenic	mg/kg	13	16	3.9		1.2	0.93	J	0.88	1.6	J	1.3	2.7	J	1.3
Barium	mg/kg	350	400	689		2.2	23.1	J	1.7	34.8	J	2.4	35.1	J	2.5
Beryllium	mg/kg	7.2	72	0.92		0.089	0.27	J	0.067	0.39	J	0.098	0.29	J	0.1
Cadmium	mg/kg	2.5	4.3	0.68	J	0.14	0.1	U	0.1	0.15	U	0.15	0.15	U	0.15
Calcium	mg/kg	NA	NA	11200		59.2	495	J	44.5	531	J	64.8	944	J	66.6
Chromium	mg/kg	NA	NA	14		0.36	8.7		0.27	14.5		0.39	10.9		0.4
Cobalt	mg/kg	NA	NA	5.3	J	1.2	4.1	J	0.93	5.5	J	1.4	5.3	J	1.4
Copper	mg/kg	50	270	38.5		2.7	7.8		2	13.9		2.9	9.4		3
Cyanide, Total	mg/kg	27	27	0.25	J	0.13	0.11	U	0.11	0.11	U	0.11	0.12	U	0.12
Iron	mg/kg	NA	NA	14800		14.8	17200		11.1	19300		16.2	20700		16.6
Lead	mg/kg	63	400	723		0.53	3.3		0.4	5.2		0.58	6.1		0.59
Magnesium	mg/kg	NA	NA	2100		58.6	1370		44.1	1680		64.1	1490		65.9
Manganese	mg/kg	1600	2000	200		0.35	458		0.26	451		0.38	675		0.39
Mercury	mg/kg	0.18	0.81	0.44		0.012	0.01	U	0.01	0.01	U	0.01	0.011	U	0.011
Nickel	mg/kg	30	310	12.6		0.74	18		0.56	13.1		0.81	24.6		0.83
Potassium	mg/kg	NA	NA	880	J	62.5	409	J	47	639	J	68.4	575	J	70.3
Selenium	mg/kg	3.9	180	2.4	U	2.4	1.8	U	1.8	2.6	U	2.6	2.7	U	2.7
Silver	mg/kg	2	180	0.19	U	0.19	0.14	U	0.14	0.21	U	0.21	0.21	U	0.21
Sodium	mg/kg	NA	NA	147	J	80.8	60.8	U	60.8	88.5	U	88.5	90.9	U	90.9
Thallium	mg/kg	NA	NA	0.64	U	0.64	0.52	J	0.48	0.7	U	0.7	0.72	U	0.72
Vanadium	mg/kg	NA	NA	19.4		0.67	13.9		0.5	20.9		0.73	17.6		0.75
Zinc	mg/kg	109	NA	425		4.7	18.1		3.5	29.7		5.1	23.2		5.3

Notes:

SB-14(3-3.5) - Sample ID(Sample

mg/kg - milligrams per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory Minimum Detection

SCO - Soil Cleanup Objective

Detected above the Unrestricted Use SCO

Detected above the Restricted Residential SCO

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1F
Summary of Soil/Fill Sampling Results
PFAS
1510 Broadway, Brooklyn, NY

Sample ID		SB-14(3-3.5)			SB-14(8-8.5)			SB-14(14.5-15)			SB-14(19-19.5)			SB-15(2-2.5)			SB-15(9-9.5)		
Lab Sample ID		460-182722-9			460-182722-10			460-182722-11			460-182722-12			460-182722-13			460-182722-14		
Sampling Date/Time		05/22/2019 09:05:00			05/22/2019 09:15:00			05/22/2019 09:20:00			05/22/2019 09:25:00			05/22/2019 10:45:00			05/22/2019 10:50:00		
Sample Matrix		Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
FLUORINATED ALKYL SUBSTANCES																			
6:2 FTS	ug/kg	0.18	U	0.18	0.22	U	0.22	0.16	U	0.16	0.16	U	0.16	0.17	U	0.17	0.2	U	0.2
8:2 FTS	ug/kg	0.45	J	0.3	0.37	U	0.37	0.27	U	0.27	0.27	U	0.27	1.01	J	0.29	0.34	U	0.34
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ug/kg	0.44	U	0.44	0.54	U	0.54	0.41	U	0.41	0.4	U	0.4	0.43	U	0.43	0.5	U	0.5
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ug/kg	0.46	U	0.46	0.57	U	0.57	0.43	U	0.43	0.42	U	0.42	0.45	U	0.45	0.53	U	0.53
Perfluorobutanesulfonic acid (PFBS)	ug/kg	0.03	U	0.03	0.037	U	0.037	0.027	U	0.027	0.027	U	0.027	0.029	U	0.029	0.034	U	0.034
Perfluorobutanoic acid (PFBA)	ug/kg	0.13	J B	0.033	0.08	J B	0.041	0.066	J B	0.031	0.06	J B	0.03	1.03	B	0.032	0.038	U	0.038
Perfluorodecanesulfonic acid (PFDS)	ug/kg	0.046	U	0.046	0.057	U	0.057	0.043	U	0.043	0.042	U	0.042	0.045	U	0.045	0.053	U	0.053
Perfluorodecanoic acid (PFDA)	ug/kg	0.091	J	0.026	0.032	U	0.032	0.024	U	0.024	0.024	U	0.024	0.025	U	0.025	0.03	U	0.03
Perfluorododecanoic acid (PFDoA)	ug/kg	0.08	U	0.08	0.098	U	0.098	0.074	U	0.074	0.072	U	0.072	0.078	U	0.078	0.091	U	0.091
Perfluoroheptanesulfonic Acid (PFHpS)	ug/kg	0.042	U	0.042	0.051	U	0.051	0.038	U	0.038	0.037	U	0.037	0.041	U	0.041	0.047	U	0.047
Perfluoroheptanoic acid (PFHpA)	ug/kg	0.1	J	0.035	0.043	U	0.043	0.032	U	0.032	0.031	U	0.031	0.1	J	0.034	0.35		0.039
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	0.05	J	0.037	0.045	U	0.045	0.034	U	0.034	0.033	U	0.033	0.036	U	0.036	0.1	J	0.042
Perfluorohexanoic acid (PFHxA)	ug/kg	0.056	J	0.05	0.062	U	0.062	0.046	U	0.046	0.045	U	0.045	0.049	U	0.049	0.28		0.057
Perfluorononanoic acid (PFNA)	ug/kg	0.34		0.043	0.053	U	0.053	0.04	U	0.04	0.039	U	0.039	0.18	J	0.042	0.22	J	0.049
Perfluorooctanesulfonamide (FOSA)	ug/kg	0.098	U	0.098	0.12	U	0.12	0.09	U	0.09	0.088	U	0.088	0.095	U	0.095	0.11	U	0.11
Perfluorooctanesulfonic acid (PFOS)	ug/kg	1.27		0.24	0.29	U	0.29	0.22	U	0.22	0.21	U	0.21	1.62		0.23	2.83		0.27
Perfluorooctanoic acid (PFOA)	ug/kg	0.45		0.1	0.13	U	0.13	0.094	U	0.094	0.12	J	0.092	0.15	J	0.1	1.69		0.12
Perfluoropentanoic acid (PFPeA)	ug/kg	0.17	J B	0.092	0.11	U	0.11	0.085	U	0.085	0.082	U	0.082	1.41	B	0.089	0.1	U	0.1
Perfluorotetradecanoic acid (PFTeA)	ug/kg	0.064	U	0.064	0.079	U	0.079	0.059	U	0.059	0.058	U	0.058	0.063	U	0.063	0.073	U	0.073
Perfluorotridecanoic acid (PFTriA)	ug/kg	0.061	U	0.061	0.075	U	0.075	0.056	U	0.056	0.055	U	0.055	0.059	U	0.059	0.069	U	0.069
Perfluoroundecanoic acid (PFUnA)	ug/kg	0.062	J	0.043	0.053	U	0.053	0.04	U	0.04	0.039	U	0.039	0.042	U	0.042	0.049	U	0.049
Total PFAS (Excluding PFOS & PFOA)	ug/kg	1.449			0.08			0.066			0.06			3.55			0.95		
Total PFAS	ug/kg	3.169			0.08			0.066			0.18			5.32			5.47		

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

ug/kg - micrograms per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory MDL

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1F
 Summary of Soil/Fill Sampling Results
 PFAS
 1510 Broadway, Brooklyn, NY

Sample ID		SB-15(12.5-13)			SB-15(18-18.5)			SB-16(4-4.5)			SB-16(9.5-10)			SB-16(11.5-12)			SB-16(16-16.5)		
Lab Sample ID		460-182722-15			460-182722-16			460-182722-5			460-182722-6			460-182722-7			460-182722-8		
Sampling Date/Time		05/22/2019 09:55:00			05/22/2019 11:00:00			05/22/2019 08:15:00			05/22/2019 08:20:00			05/22/2019 08:30:00			05/22/2019 08:35:00		
Sample Matrix		Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
FLUORINATED ALKYL SUBSTANCES																			
6:2 FTS	ug/kg	0.19	U	0.19	0.16	U	0.16	0.17	U	0.17	0.18	U	0.18	0.17	U	0.17	0.19	U	0.19
8:2 FTS	ug/kg	0.31	U	0.31	0.27	U	0.27	2.12	J	0.29	0.31	U	0.31	3.36		0.28	1.67	J	0.31
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ug/kg	0.46	U	0.46	0.4	U	0.4	0.43	U	0.43	0.45	U	0.45	0.42	U	0.42	0.46	U	0.46
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ug/kg	0.48	U	0.48	0.42	U	0.42	0.45	U	0.45	0.48	U	0.48	0.44	U	0.44	0.48	U	0.48
Perfluorobutanesulfonic acid (PFBS)	ug/kg	0.031	U	0.031	0.027	U	0.027	0.029	U	0.029	0.031	U	0.031	0.028	U	0.028	0.031	U	0.031
Perfluorobutanoic acid (PFBA)	ug/kg	0.11	J B	0.035	0.053	J B	0.03	0.13	J B	0.033	0.081	J B	0.034	0.2	J B	0.032	0.11	J B	0.035
Perfluorodecanesulfonic acid (PFDS)	ug/kg	0.048	U	0.048	0.042	U	0.042	0.045	U	0.045	0.048	U	0.048	0.044	U	0.044	0.048	U	0.048
Perfluorodecanoic acid (PFDA)	ug/kg	0.027	U	0.027	0.024	U	0.024	0.041	J	0.026	0.12	J	0.027	0.074	J	0.025	0.046	J	0.027
Perfluorododecanoic acid (PFDoA)	ug/kg	0.083	U	0.083	0.073	U	0.073	0.078	U	0.078	0.082	U	0.082	0.076	U	0.076	0.083	U	0.083
Perfluoroheptanesulfonic Acid (PFHpS)	ug/kg	0.043	U	0.043	0.038	U	0.038	0.041	U	0.041	0.043	U	0.043	0.04	U	0.04	0.043	U	0.043
Perfluoroheptanoic acid (PFHpA)	ug/kg	0.036	U	0.036	0.032	U	0.032	0.13	J	0.034	0.062	J	0.036	0.18	J	0.033	0.14	J	0.036
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	0.038	U	0.038	0.034	U	0.034	0.036	U	0.036	0.038	U	0.038	0.035	U	0.035	0.038	U	0.038
Perfluorohexanoic acid (PFHxA)	ug/kg	0.052	U	0.052	0.046	U	0.046	0.049	U	0.049	0.052	J	0.051	0.075	J	0.048	0.053	J	0.052
Perfluorononanoic acid (PFNA)	ug/kg	0.045	U	0.045	0.039	U	0.039	0.54		0.042	0.25		0.044	0.97		0.041	0.58		0.045
Perfluorooctanesulfonamide (FOSA)	ug/kg	0.1	U	0.1	0.089	U	0.089	0.095	U	0.095	0.1	U	0.1	0.093	U	0.093	0.1	U	0.1
Perfluorooctanesulfonic acid (PFOS)	ug/kg	1.25		0.25	0.22	U	0.22	1.86		0.23	2.88		0.25	3.54		0.23	1.96		0.25
Perfluorooctanoic acid (PFOA)	ug/kg	0.12	J	0.11	0.093	U	0.093	0.51		0.1	0.28		0.11	0.98		0.098	0.6		0.11
Perfluoropentanoic acid (PFPeA)	ug/kg	0.095	U	0.095	0.084	U	0.084	0.15	J B	0.089	0.094	U	0.094	0.17	J B	0.087	0.1	J B	0.095
Perfluorotetradecanoic acid (PFTeA)	ug/kg	0.067	U	0.067	0.059	U	0.059	0.063	U	0.063	0.066	U	0.066	0.061	U	0.061	0.067	U	0.067
Perfluorotridecanoic acid (PFTriA)	ug/kg	0.063	U	0.063	0.055	U	0.055	0.059	U	0.059	0.062	U	0.062	0.058	U	0.058	0.063	U	0.063
Perfluoroundecanoic acid (PFUnA)	ug/kg	0.045	U	0.045	0.039	U	0.039	0.042	J	0.042	0.1	J	0.044	0.048	J	0.041	0.045	U	0.045
Total PFAS (Excluding PFOS & PFOA)	ug/kg	0.11			0.053			3.153			0.665			5.077			2.699		
Total PFAS	ug/kg	1.48			0.053			5.523			3.825			9.597			5.259		

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

ug/kg - micrograms per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory MDL

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1F
 Summary of Soil/Fill Sampling Results
 PFAS
 1510 Broadway, Brooklyn, NY

Sample ID		SB-19(2-2.5)			SB-19(6-6.5)			SB-19(13.5-14)			SB-19(17-17.5)			SB-20(4.5-5)			SB-20(6.5-7)		
Lab Sample ID		460-182722-1			460-182722-2			460-182722-3			460-182722-4			460-182722-17			460-182722-18		
Sampling Date/Time		05/22/2019 07:55:00			05/22/2019 08:00:00			05/22/2019 08:05:00			05/22/2019 08:10:00			05/22/2019 11:15:00			05/22/2019 11:20:00		
Sample Matrix		Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
FLUORINATED ALKYL SUBSTANCES																			
6:2 FTS	ug/kg	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	0.16	U	0.16	0.19	U	0.19
8:2 FTS	ug/kg	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	0.29	U	0.29	0.27	U	0.27	0.32	U	0.32
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ug/kg	0.41	U	0.41	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43	0.4	U	0.4	0.47	U	0.47
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ug/kg	0.43	U	0.43	0.44	U	0.44	0.44	U	0.44	0.45	U	0.45	0.42	U	0.42	0.49	U	0.49
Perfluorobutanesulfonic acid (PFBS)	ug/kg	0.028	U	0.028	0.028	U	0.028	0.028	U	0.028	0.029	U	0.029	0.027	U	0.027	0.032	U	0.032
Perfluorobutanoic acid (PFBA)	ug/kg	0.38	B	0.031	0.069	J B	0.031	0.15	J B	0.032	0.11	J B	0.032	0.03	U	0.03	0.15	J B	0.035
Perfluorodecanesulfonic acid (PFDS)	ug/kg	0.043	U	0.043	0.044	U	0.044	0.044	U	0.044	0.045	U	0.045	0.042	U	0.042	0.049	U	0.049
Perfluorodecanoic acid (PFDA)	ug/kg	0.039	J	0.024	0.025	U	0.025	0.025	U	0.025	0.025	U	0.025	0.024	U	0.024	0.028	U	0.028
Perfluorododecanoic acid (PFDoA)	ug/kg	0.074	U	0.074	0.075	U	0.075	0.076	U	0.076	0.077	U	0.077	0.073	U	0.073	0.085	U	0.085
Perfluoroheptanesulfonic Acid (PFHpS)	ug/kg	0.039	U	0.039	0.039	U	0.039	0.04	U	0.04	0.04	U	0.04	0.038	U	0.038	0.044	U	0.044
Perfluoroheptanoic acid (PFHpA)	ug/kg	0.082	J	0.032	0.032	U	0.032	0.033	J	0.033	0.033	U	0.033	0.14	J	0.031	0.055	J	0.037
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	0.048	J	0.034	0.035	U	0.035	0.035	U	0.035	0.036	U	0.036	0.034	U	0.034	0.039	U	0.039
Perfluorohexanoic acid (PFHxA)	ug/kg	0.073	J	0.047	0.047	U	0.047	0.048	U	0.048	0.048	U	0.048	0.045	U	0.045	0.053	U	0.053
Perfluorononanoic acid (PFNA)	ug/kg	0.19	J	0.04	0.04	U	0.04	0.041	U	0.041	0.042	U	0.042	0.26		0.039	0.098	J	0.045
Perfluorooctanesulfonamide (FOSA)	ug/kg	0.091	U	0.091	0.092	U	0.092	0.093	U	0.093	0.095	U	0.095	0.089	U	0.089	0.1	U	0.1
Perfluorooctanesulfonic acid (PFOS)	ug/kg	1.84		0.22	0.22	U	0.22	1.53		0.23	1.18		0.23	1.55		0.22	0.98		0.25
Perfluorooctanoic acid (PFOA)	ug/kg	0.31		0.095	0.52		0.096	0.46		0.098	0.39		0.099	0.48		0.093	0.25		0.11
Perfluoropentanoic acid (PFPeA)	ug/kg	0.085	U	0.085	0.086	U	0.086	0.088	U	0.088	0.089	U	0.089	0.083	U	0.083	0.097	U	0.097
Perfluorotetradecanoic acid (PFTeA)	ug/kg	0.06	U	0.06	0.061	U	0.061	0.061	U	0.061	0.062	U	0.062	0.058	U	0.058	0.068	U	0.068
Perfluorotridecanoic acid (PFTriA)	ug/kg	0.057	U	0.057	0.057	U	0.057	0.058	U	0.058	0.059	U	0.059	0.055	U	0.055	0.064	U	0.064
Perfluoroundecanoic acid (PFUnA)	ug/kg	0.04	U	0.04	0.04	U	0.04	0.041	U	0.041	0.042	U	0.042	0.039	U	0.039	0.045	U	0.045
Total PFAS (Excluding PFOS & PFOA)	ug/kg	0.812			0.069			0.183			0.11			0.26			0.303		
Total PFAS	ug/kg	2.962			0.589			2.173			1.68			2.29			1.533		

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

ug/kg - micrograms per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory MDL

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

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Table 1F
Summary of Soil/Fill Sampling Results
PFAS
1510 Broadway, Brooklyn, NY

Sample ID		SB-20(10.5-11)			SB-20(16-16.5)			SB-21 (1-1.5)			SB-21 (7-7.5)			SB-21 (12.5-13)			SB-21 (18-18.5)			
Lab Sample ID		460-182722-19			460-182722-20			460-182616-1			460-182616-2			460-182616-3			460-182616-4			
Sampling Date/Time		05/22/2019 11:25:00			05/22/2019 11:30:00			05/21/2019 13:00:00			05/21/2019 13:10:00			05/21/2019 13:20:00			05/21/2019 13:30:00			
Sample Matrix		Soil			Soil			Soil			Soil			Soil			Soil			
Analyte	Units	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
FLUORINATED ALKYL SUBSTANCES																				
6:2 FTS	ug/kg	0.16	U	0.16	0.15	U	0.15	0.18	U	0.18	0.16	U	0.16	0.16	U	0.16	0.15	U	0.15	
8:2 FTS	ug/kg	0.26	U	0.26	0.25	U	0.25	0.31	U	0.31	0.26	U	0.26	0.26	U	0.26	0.25	U	0.25	
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ug/kg	0.39	U	0.39	0.37	U	0.37	1.59	J	0.46	0.39	U	0.39	0.39	U	0.39	0.37	U	0.37	
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ug/kg	0.41	U	0.41	0.39	U	0.39	0.48	U	0.48	0.41	U	0.41	0.41	U	0.41	0.39	U	0.39	
Perfluorobutanesulfonic acid (PFBS)	ug/kg	0.026	U	0.026	0.025	U	0.025	0.031	U	0.031	0.026	U	0.026	0.026	U	0.026	0.025	U	0.025	
Perfluorobutanoic acid (PFBA)	ug/kg	0.071	J B	0.029	0.069	J B	0.028	0.092	J B	0.034	0.077	J B	0.029	0.057	J B	0.029	0.068	J B	0.028	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	0.041	U	0.041	0.039	U	0.039	0.051	J	0.048	0.041	U	0.041	0.041	U	0.041	0.039	U	0.039	
Perfluorodecanoic acid (PFDA)	ug/kg	0.023	U	0.023	0.022	U	0.022	0.038	J	0.027	0.023	U	0.023	0.023	U	0.023	0.022	U	0.022	
Perfluorododecanoic acid (PFDoA)	ug/kg	0.07	U	0.07	0.066	U	0.066	0.082	U	0.082	0.07	U	0.07	0.07	U	0.07	0.068	U	0.068	
Perfluoroheptanesulfonic Acid (PFHpS)	ug/kg	0.037	U	0.037	0.035	U	0.035	0.043	U	0.043	0.037	U	0.037	0.037	U	0.037	0.035	U	0.035	
Perfluoroheptanoic acid (PFHpA)	ug/kg	0.036	J	0.03	0.029	J	0.029	0.036	U	0.036	0.03	U	0.03	0.03	U	0.03	0.029	U	0.029	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	0.033	U	0.033	0.031	U	0.031	1		0.038	0.038	J	0.032	0.033	U	0.033	0.031	U	0.031	
Perfluorohexanoic acid (PFHxA)	ug/kg	0.044	U	0.044	0.041	U	0.041	0.052	U	0.052	0.044	U	0.044	0.044	U	0.044	0.042	U	0.042	
Perfluorononanoic acid (PFNA)	ug/kg	0.038	U	0.038	0.036	U	0.036	0.044	U	0.044	0.038	U	0.038	0.038	U	0.038	0.036	U	0.036	
Perfluorooctanesulfonamide (FOSA)	ug/kg	0.086	U	0.086	0.081	U	0.081	1.07		0.1	0.086	U	0.086	0.086	U	0.086	0.083	U	0.083	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	0.21	U	0.21	0.2	U	0.2	8.4		0.25	8.87		0.21	1.08		0.21	0.27	J	0.2	
Perfluorooctanoic acid (PFOA)	ug/kg	0.15	J	0.09	0.13	J	0.085	0.11	J	0.11	0.14	J	0.09	0.09	U	0.09	0.087	U	0.087	
Perfluoropentanoic acid (PFPeA)	ug/kg	0.081	U	0.081	0.076	U	0.076	0.095	U	0.095	0.081	U	0.081	0.081	U	0.081	0.078	U	0.078	
Perfluorotetradecanoic acid (PFTeA)	ug/kg	0.057	U	0.057	0.053	U	0.053	0.066	U	0.066	0.056	U	0.056	0.057	U	0.057	0.055	U	0.055	
Perfluorotridecanoic acid (PFTriA)	ug/kg	0.054	U	0.054	0.05	U	0.05	0.063	U	0.063	0.053	U	0.053	0.054	U	0.054	0.052	U	0.052	
Perfluoroundecanoic acid (PFUnA)	ug/kg	0.038	U	0.038	0.036	U	0.036	0.054	J	0.044	0.038	U	0.038	0.038	U	0.038	0.036	U	0.036	
Total PFAS (Excluding PFOS & PFOA)	ug/kg	0.107			0.069			2.825			0.115			0.057			0.068			
Total PFAS	ug/kg	0.257			0.199			11.335			9.125			1.137			0.338			

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

ug/kg - micrograms per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory MDL

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1F
 Summary of Soil/Fill Sampling Results
 PFAS
 1510 Broadway, Brooklyn, NY

Sample ID		SB-22 (3.5-4)			SB-22 (6-6.5)			SB-22 (14-14.5)			SB-22 (16.5-17)			SB-23 (4-4.5)			SB-23 (6.5-7)		
Lab Sample ID		460-182616-5			460-182616-6			460-182616-7			460-182616-8			460-182440-1			460-182440-2		
Sampling Date/Time		05/21/2019 13:45:00			05/21/2019 13:50:00			05/21/2019 14:00:00			05/21/2019 14:05:00			05/20/2019 09:00:00			05/20/2019 09:05:00		
Sample Matrix		Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
FLUORINATED ALKYL SUBSTANCES																			
6:2 FTS	ug/kg	0.19	U	0.19	0.17	U	0.17	0.16	U	0.16	0.16	U	0.16	0.14	U	0.14	0.2	U	0.2
8:2 FTS	ug/kg	0.31	U	0.31	0.28	U	0.28	0.27	U	0.27	0.26	U	0.26	0.24	U	0.24	0.33	U	0.33
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ug/kg	0.46	U	0.46	0.41	U	0.41	0.41	U	0.41	0.39	U	0.39	0.36	U	0.36	0.5	U	0.5
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ug/kg	0.48	U	0.48	0.44	U	0.44	0.43	U	0.43	0.41	U	0.41	0.37	U	0.37	0.52	U	0.52
Perfluorobutanesulfonic acid (PFBS)	ug/kg	0.031	U	0.031	0.028	U	0.028	0.027	U	0.027	0.026	U	0.026	0.024	U	0.024	0.033	U	0.033
Perfluorobutanoic acid (PFBA)	ug/kg	0.035	U	0.035	0.069	J B	0.031	0.071	J B	0.031	0.074	J B	0.029	0.027	U	0.027	0.072	J B	0.037
Perfluorodecanesulfonic acid (PFDS)	ug/kg	0.048	U	0.048	0.044	U	0.044	0.043	U	0.043	0.041	U	0.041	0.037	U	0.037	0.052	U	0.052
Perfluorodecanoic acid (PFDA)	ug/kg	0.027	U	0.027	0.025	U	0.025	0.024	U	0.024	0.023	U	0.023	0.021	U	0.021	0.066	J	0.029
Perfluorododecanoic acid (PFDoA)	ug/kg	0.083	U	0.083	0.075	U	0.075	0.073	U	0.073	0.07	U	0.07	0.064	U	0.064	0.09	U	0.09
Perfluoroheptanesulfonic Acid (PFHpS)	ug/kg	0.043	U	0.043	0.039	U	0.039	0.038	U	0.038	0.037	U	0.037	0.034	U	0.034	0.047	U	0.047
Perfluoroheptanoic acid (PFHpA)	ug/kg	0.036	U	0.036	0.032	U	0.032	0.032	U	0.032	0.03	U	0.03	0.11	J	0.028	0.049	J	0.039
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	0.038	U	0.038	0.035	U	0.035	0.034	U	0.034	0.032	U	0.032	0.03	U	0.03	0.041	U	0.041
Perfluorohexanoic acid (PFHxA)	ug/kg	0.052	U	0.052	0.047	U	0.047	0.046	U	0.046	0.044	U	0.044	0.1	J	0.04	0.056	U	0.056
Perfluorononanoic acid (PFNA)	ug/kg	0.09	J	0.044	0.04	U	0.04	0.039	U	0.039	0.038	U	0.038	0.067	J	0.035	0.058	J	0.048
Perfluorooctanesulfonamide (FOSA)	ug/kg	0.1	U	0.1	0.091	U	0.091	0.09	U	0.09	0.086	U	0.086	0.079	U	0.079	0.11	U	0.11
Perfluorooctanesulfonic acid (PFOS)	ug/kg	1.5		0.25	0.22	U	0.22	0.22	U	0.22	0.21	U	0.21	0.84		0.19	2		0.27
Perfluorooctanoic acid (PFOA)	ug/kg	0.25		0.11	0.16	J	0.096	0.094	U	0.094	0.09	U	0.09	0.53		0.083	0.4		0.12
Perfluoropentanoic acid (PFPeA)	ug/kg	0.095	U	0.095	0.086	U	0.086	0.084	U	0.084	0.08	U	0.08	0.074	U	0.074	0.1	U	0.1
Perfluorotetradecanoic acid (PFTeA)	ug/kg	0.067	U	0.067	0.06	U	0.06	0.059	U	0.059	0.056	U	0.056	0.052	U	0.052	0.072	U	0.072
Perfluorotridecanoic acid (PFTriA)	ug/kg	0.063	U	0.063	0.057	U	0.057	0.056	U	0.056	0.053	U	0.053	0.049	U	0.049	0.068	U	0.068
Perfluoroundecanoic acid (PFUnA)	ug/kg	0.044	U	0.044	0.04	U	0.04	0.039	U	0.039	0.038	U	0.038	0.035	U	0.035	0.048	U	0.048
Total PFAS (Excluding PFOS & PFOA)	ug/kg	0.09			0.069			0.071			0.074			0.277			0.245		
Total PFAS	ug/kg	1.84			0.229			0.071			0.074			1.647			2.645		

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

ug/kg - micrograms per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory MDL

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1F
Summary of Soil/Fill Sampling Results
PFAS
1510 Broadway, Brooklyn, NY

Sample ID		SB-23 (12.5-13.0)			SB-23 (19-19.5)			SB-29 (3-3.5)			SB-29 (7-7.5)			SB-29 (14.5-15)		
Lab Sample ID		460-182440-3			460-182440-4			460-182440-5			460-182440-6			460-182440-7		
Sampling Date/Time		05/20/2019 09:10:00			05/20/2019 09:15:00			05/20/2019 10:00:00			05/20/2019 10:05:00			05/20/2019 10:10:00		
Sample Matrix		Soil			Soil			Soil			Soil			Soil		
Analyte	Units	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
FLUORINATED ALKYL SUBSTANCES																
6:2 FTS	ug/kg	0.16	U	0.16	0.17	U	0.17	0.16	U	0.16	0.17	U	0.17	0.17	U	0.17
8:2 FTS	ug/kg	0.27	U	0.27	0.28	U	0.28	0.27	U	0.27	0.29	U	0.29	0.28	U	0.28
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ug/kg	0.39	U	0.39	0.41	U	0.41	0.4	U	0.4	0.42	U	0.42	0.41	U	0.41
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ug/kg	0.41	U	0.41	0.43	U	0.43	0.43	U	0.43	0.45	U	0.45	0.43	U	0.43
Perfluorobutanesulfonic acid (PFBS)	ug/kg	0.027	U	0.027	0.028	U	0.028	0.027	U	0.027	0.029	U	0.029	0.028	U	0.028
Perfluorobutanoic acid (PFBA)	ug/kg	0.041	J B	0.03	0.055	J B	0.031	0.071	J B	0.031	0.032	U	0.032	0.071	J B	0.031
Perfluorodecanesulfonic acid (PFDS)	ug/kg	0.041	U	0.041	0.043	U	0.043	0.043	U	0.043	0.045	U	0.045	0.043	U	0.043
Perfluorodecanoic acid (PFDA)	ug/kg	0.023	U	0.023	0.024	U	0.024	0.024	U	0.024	0.025	U	0.025	0.024	U	0.024
Perfluorododecanoic acid (PFDoA)	ug/kg	0.071	U	0.071	0.074	U	0.074	0.073	U	0.073	0.076	U	0.076	0.074	U	0.074
Perfluoroheptanesulfonic Acid (PFHpS)	ug/kg	0.037	U	0.037	0.039	U	0.039	0.038	U	0.038	0.04	U	0.04	0.039	U	0.039
Perfluoroheptanoic acid (PFHpA)	ug/kg	0.031	U	0.031	0.032	U	0.032	0.058	J	0.032	0.053	J	0.033	0.072	J	0.032
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	0.038	J	0.033	0.034	U	0.034	0.034	U	0.034	0.035	U	0.035	0.034	U	0.034
Perfluorohexanoic acid (PFHxA)	ug/kg	0.045	U	0.045	0.046	U	0.046	0.065	J	0.046	0.048	U	0.048	0.065	J	0.046
Perfluorononanoic acid (PFNA)	ug/kg	0.038	U	0.038	0.04	U	0.04	0.076	J	0.039	0.041	U	0.041	0.056	J	0.04
Perfluorooctanesulfonamide (FOSA)	ug/kg	0.087	U	0.087	0.091	U	0.091	0.09	U	0.09	0.094	U	0.094	0.09	U	0.09
Perfluorooctanesulfonic acid (PFOS)	ug/kg	0.21	U	0.21	0.22	U	0.22	0.98		0.22	0.27	J	0.23	0.5	J	0.22
Perfluorooctanoic acid (PFOA)	ug/kg	0.15	J	0.091	0.13	J	0.095	0.26		0.094	0.26		0.098	0.29		0.095
Perfluoropentanoic acid (PFPeA)	ug/kg	0.082	U	0.082	0.085	U	0.085	0.088	J	0.084	0.088	U	0.088	0.085	U	0.085
Perfluorotetradecanoic acid (PFTeA)	ug/kg	0.057	U	0.057	0.06	U	0.06	0.059	U	0.059	0.062	U	0.062	0.059	U	0.059
Perfluorotridecanoic acid (PFTriA)	ug/kg	0.054	U	0.054	0.056	U	0.056	0.056	U	0.056	0.058	U	0.058	0.056	U	0.056
Perfluoroundecanoic acid (PFUnA)	ug/kg	0.038	U	0.038	0.04	U	0.04	0.039	U	0.039	0.041	U	0.041	0.04	U	0.04
Total PFAS (Excluding PFOS & PFOA)	ug/kg	0.079			0.055			0.27			0.053			0.264		
Total PFAS	ug/kg	0.229			0.185			1.51			0.583			1.054		

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

ug/kg - micrograms per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory MDL

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1F
 Summary of Soil/Fill Sampling Results
 PFAS
 1510 Broadway, Brooklyn, NY

Sample ID		SB-29 (18-18.5)			SB-30 (2-2.5)			SB-30 (8.5-9.0)			SB-30 (16.5-17.0)			SB-30 (13-13.5)			SB-31 (1-1.5)		
Lab Sample ID		460-182440-8			460-182440-9			460-182440-10			460-182440-11			460-182440-12			460-182440-13		
Sampling Date/Time		05/20/2019 10:15:00			05/20/2019 09:20:00			05/20/2019 09:25:00			05/20/2019 09:35:00			05/20/2019 09:30:00			05/20/2019 09:40:00		
Sample Matrix		Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
FLUORINATED ALKYL SUBSTANCES																			
6:2 FTS	ug/kg	0.16	U	0.16	0.17	U	0.17	0.17	U	0.17	0.16	U	0.16	0.15	U	0.15	0.16	U	0.16
8:2 FTS	ug/kg	0.27	U	0.27	0.29	J	0.29	0.29	U	0.29	0.27	U	0.27	0.26	U	0.26	0.27	U	0.27
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ug/kg	0.39	U	0.39	0.43	U	0.43	0.42	U	0.42	0.4	U	0.4	0.38	U	0.38	0.4	U	0.4
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ug/kg	0.41	U	0.41	0.45	U	0.45	0.45	U	0.45	0.42	U	0.42	0.4	U	0.4	0.42	U	0.42
Perfluorobutanesulfonic acid (PFBS)	ug/kg	0.027	U	0.027	0.029	U	0.029	0.029	U	0.029	0.027	U	0.027	0.026	U	0.026	0.027	U	0.027
Perfluorobutanoic acid (PFBA)	ug/kg	0.061	J B	0.03	0.033	U	0.033	0.032	U	0.032	0.03	U	0.03	0.044	J B	0.029	0.03	U	0.03
Perfluorodecanesulfonic acid (PFDS)	ug/kg	0.041	U	0.041	0.045	U	0.045	0.045	U	0.045	0.042	U	0.042	0.04	U	0.04	0.042	U	0.042
Perfluorodecanoic acid (PFDA)	ug/kg	0.023	U	0.023	0.14	J	0.026	0.025	U	0.025	0.024	U	0.024	0.023	U	0.023	0.024	U	0.024
Perfluorododecanoic acid (PFDoA)	ug/kg	0.071	U	0.071	0.078	U	0.078	0.077	U	0.077	0.072	U	0.072	0.069	U	0.069	0.072	U	0.072
Perfluoroheptanesulfonic Acid (PFHpS)	ug/kg	0.037	U	0.037	0.041	U	0.041	0.04	U	0.04	0.037	U	0.037	0.036	U	0.036	0.038	U	0.038
Perfluoroheptanoic acid (PFHpA)	ug/kg	0.031	U	0.031	0.2	J	0.034	0.073	J	0.033	0.05	J	0.031	0.03	U	0.03	0.086	J	0.031
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	0.033	U	0.033	0.065	J	0.036	0.035	U	0.035	0.033	U	0.033	0.032	U	0.032	0.06	J	0.033
Perfluorohexanoic acid (PFHxA)	ug/kg	0.045	U	0.045	0.19	J	0.049	0.048	U	0.048	0.045	U	0.045	0.043	U	0.043	0.1	J	0.045
Perfluorononanoic acid (PFNA)	ug/kg	0.038	U	0.038	0.21	J	0.042	0.08	J	0.041	0.038	U	0.038	0.037	U	0.037	0.054	J	0.039
Perfluorooctanesulfonamide (FOSA)	ug/kg	0.087	U	0.087	0.096	U	0.096	0.094	U	0.094	0.088	U	0.088	0.084	U	0.084	0.088	U	0.088
Perfluorooctanesulfonic acid (PFOS)	ug/kg	0.21	U	0.21	1.2		0.23	0.5	J	0.23	0.36	J	0.21	0.25	J	0.21	1.4		0.22
Perfluorooctanoic acid (PFOA)	ug/kg	0.091	U	0.091	0.52		0.1	0.27		0.098	0.2	J	0.092	0.12	J	0.088	0.58		0.092
Perfluoropentanoic acid (PFPeA)	ug/kg	0.082	U	0.082	0.09	U	0.09	0.088	U	0.088	0.082	U	0.082	0.079	U	0.079	0.083	U	0.083
Perfluorotetradecanoic acid (PFTeA)	ug/kg	0.057	U	0.057	0.081	J	0.063	0.062	U	0.062	0.058	U	0.058	0.055	U	0.055	0.058	U	0.058
Perfluorotridecanoic acid (PFTriA)	ug/kg	0.054	U	0.054	0.059	U	0.059	0.058	U	0.058	0.054	U	0.054	0.052	U	0.052	0.055	U	0.055
Perfluoroundecanoic acid (PFUnA)	ug/kg	0.038	U	0.038	0.12	J	0.042	0.041	U	0.041	0.038	U	0.038	0.037	U	0.037	0.039	U	0.039
Total PFAS (Excluding PFOS & PFOA)	ug/kg	0.061			1.006			0.153			0.05			0.044			0.3		
Total PFAS	ug/kg	0.061			2.726			0.923			0.61			0.414			2.28		

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

ug/kg - micrograms per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory MDL

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1F
Summary of Soil/Fill Sampling Results
PFAS
1510 Broadway, Brooklyn, NY

Sample ID		SB-31 (9-9.5)			SB-31 (11-11.5)			SB-31 (16.5-17)			SB-32 (4-4.5)			SB-32 (7-7.5)			SB-32 (14.5-15)		
Lab Sample ID		460-182440-14			460-182440-15			460-182440-16			460-182440-17			460-182440-18			460-182440-19		
Sampling Date/Time		05/20/2019 09:45:00			05/20/2019 09:50:00			05/20/2019 09:55:00			05/20/2019 10:20:00			05/20/2019 10:22:00			05/20/2019 10:25:00		
Sample Matrix		Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
FLUORINATED ALKYL SUBSTANCES																			
6:2 FTS	ug/kg	0.18	U	0.18	0.15	U	0.15	0.23	J	0.17	0.18	U	0.18	0.19	J	0.17	0.26	J	0.17
8:2 FTS	ug/kg	0.3	U	0.3	0.26	U	0.26	0.29	U	0.29	5.5		0.3	10		0.28	13		0.28
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ug/kg	0.44	U	0.44	0.38	U	0.38	0.42	U	0.42	0.45	U	0.45	0.41	U	0.41	0.41	U	0.41
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ug/kg	0.46	U	0.46	0.4	U	0.4	0.45	U	0.45	0.47	U	0.47	0.44	U	0.44	0.43	U	0.43
Perfluorobutanesulfonic acid (PFBS)	ug/kg	0.03	U	0.03	0.026	U	0.026	0.029	U	0.029	0.03	U	0.03	0.028	U	0.028	0.072	J	0.028
Perfluorobutanoic acid (PFBA)	ug/kg	0.033	U	0.033	0.05	J	0.029	0.23	B	0.032	0.18	J	0.034	0.031	U	0.031	0.031	U	0.031
Perfluorodecanesulfonic acid (PFDS)	ug/kg	0.046	U	0.046	0.04	U	0.04	0.045	U	0.045	0.077	J	0.047	0.044	U	0.044	0.043	U	0.043
Perfluorodecanoic acid (PFDA)	ug/kg	0.026	U	0.026	0.023	U	0.023	0.025	U	0.025	0.51		0.027	0.3		0.025	0.41		0.024
Perfluorododecanoic acid (PFDoA)	ug/kg	0.08	U	0.08	0.069	U	0.069	0.077	U	0.077	0.27		0.081	0.14	J	0.075	0.13	J	0.074
Perfluoroheptanesulfonic Acid (PFHpS)	ug/kg	0.042	U	0.042	0.036	U	0.036	0.04	U	0.04	0.042	U	0.042	0.039	U	0.039	0.039	U	0.039
Perfluoroheptanoic acid (PFHpA)	ug/kg	0.035	U	0.035	0.03	U	0.03	0.069	J	0.033	0.15	J	0.035	0.75		0.032	0.35		0.032
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	0.037	U	0.037	0.032	U	0.032	0.043	J	0.036	0.056	J	0.038	0.037	J	0.035	0.11	J	0.034
Perfluorohexanoic acid (PFHxA)	ug/kg	0.05	U	0.05	0.043	U	0.043	0.048	U	0.048	0.12	J	0.051	0.32		0.047	0.21	J	0.046
Perfluorononanoic acid (PFNA)	ug/kg	0.043	U	0.043	0.037	U	0.037	0.041	U	0.041	0.46		0.044	1.3		0.04	1.1		0.04
Perfluorooctanesulfonamide (FOSA)	ug/kg	0.098	U	0.098	0.084	U	0.084	0.094	U	0.094	0.16	J	0.1	0.092	U	0.092	0.18	J	0.091
Perfluorooctanesulfonic acid (PFOS)	ug/kg	0.54	J	0.24	0.21	U	0.21	0.6		0.23	2.9		0.24	2.8		0.22	3		0.22
Perfluorooctanoic acid (PFOA)	ug/kg	0.79		0.1	0.088	U	0.088	0.69		0.099	0.33		0.1	1.6		0.096	0.85		0.095
Perfluoropentanoic acid (PFPeA)	ug/kg	0.092	U	0.092	0.079	U	0.079	0.088	U	0.088	0.16	J	0.093	0.46		0.086	0.26		0.085
Perfluorotetradecanoic acid (PFTeA)	ug/kg	0.064	U	0.064	0.056	U	0.056	0.062	U	0.062	0.11	J	0.066	0.061	J	0.06	0.06	U	0.06
Perfluorotridecanoic acid (PFTriA)	ug/kg	0.061	U	0.061	0.052	U	0.052	0.058	U	0.058	0.11	J	0.062	0.057	U	0.057	0.061	J	0.056
Perfluoroundecanoic acid (PFUnA)	ug/kg	0.043	U	0.043	0.037	U	0.037	0.041	U	0.041	0.42		0.044	0.14	J	0.04	0.22		0.04
Total PFAS (Excluding PFOS & PFOA)	ug/kg	0			0.05			0.342			8.325			13.508			16.103		
Total PFAS	ug/kg	1.33			0.05			1.632			11.555			17.908			19.953		

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

ug/kg - micrograms per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory MDL

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1F
 Summary of Soil/Fill Sampling Results
 PFAS
 1510 Broadway, Brooklyn, NY

Sample ID		SB-32 (18-18.5)			SB-33 (3.5-4.0)			SB-33 (7.5-8.0)			SB-33 (11.5-12)			SB-33 (17.0-17.5)			SB-34 (1.5-2.0)		
Lab Sample ID		460-182440-20			460-182440-21			460-182440-22			460-182440-23			460-182440-24			460-182440-25		
Sampling Date/Time		05/20/2019 10:30:00			05/20/2019 10:35:00			05/20/2019 10:40:00			05/20/2019 10:45:00			05/20/2019 10:50:00			05/20/2019 12:00:00		
Sample Matrix		Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
FLUORINATED ALKYL SUBSTANCES																			
6:2 FTS	ug/kg	0.16	U	0.16	0.16	U	0.16	0.16	U	0.16	0.16	U	0.16	0.15	U	0.15	0.16	U	0.16
8:2 FTS	ug/kg	0.49	J	0.27	0.27	U	0.27	0.26	U	0.26	0.27	U	0.27	0.26	U	0.26	0.27	U	0.27
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ug/kg	0.4	U	0.4	0.4	U	0.4	0.39	U	0.39	0.39	U	0.39	0.38	U	0.38	0.41	U	0.41
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ug/kg	0.42	U	0.42	0.42	U	0.42	0.41	U	0.41	0.41	U	0.41	0.4	U	0.4	0.43	U	0.43
Perfluorobutanesulfonic acid (PFBS)	ug/kg	0.027	U	0.027	0.027	U	0.027	0.026	U	0.026	0.027	U	0.027	0.026	U	0.026	0.027	U	0.027
Perfluorobutanoic acid (PFBA)	ug/kg	0.077	J B	0.03	0.037	J B	0.03	0.041	J B	0.029	0.043	J B	0.03	0.037	J B	0.029	0.093	J B	0.031
Perfluorodecanesulfonic acid (PFDS)	ug/kg	0.042	U	0.042	0.042	U	0.042	0.041	U	0.041	0.041	U	0.041	0.04	U	0.04	0.043	U	0.043
Perfluorodecanoic acid (PFDA)	ug/kg	0.024	U	0.024	0.024	U	0.024	0.023	U	0.023	0.023	U	0.023	0.023	U	0.023	0.079	J	0.024
Perfluorododecanoic acid (PFDoA)	ug/kg	0.073	U	0.073	0.073	U	0.073	0.07	U	0.07	0.071	U	0.071	0.069	U	0.069	0.074	U	0.074
Perfluoroheptanesulfonic Acid (PFHpS)	ug/kg	0.038	U	0.038	0.038	U	0.038	0.037	U	0.037	0.037	U	0.037	0.036	U	0.036	0.038	U	0.038
Perfluoroheptanoic acid (PFHpA)	ug/kg	0.15	J	0.032	0.031	U	0.031	0.03	U	0.03	0.031	U	0.031	0.03	U	0.03	0.056	J	0.032
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	0.034	U	0.034	0.034	U	0.034	0.032	U	0.032	0.033	U	0.033	0.032	U	0.032	0.034	U	0.034
Perfluorohexanoic acid (PFHxA)	ug/kg	0.057	J	0.046	0.046	U	0.046	0.044	U	0.044	0.045	U	0.045	0.043	U	0.043	0.07	J	0.046
Perfluorononanoic acid (PFNA)	ug/kg	0.046	J	0.039	0.039	U	0.039	0.038	U	0.038	0.038	U	0.038	0.037	U	0.037	0.12	J	0.04
Perfluorooctanesulfonamide (FOSA)	ug/kg	0.089	U	0.089	0.089	U	0.089	0.086	U	0.086	0.087	U	0.087	0.084	U	0.084	0.09	U	0.09
Perfluorooctanesulfonic acid (PFOS)	ug/kg	0.22	U	0.22	0.22	U	0.22	0.21	U	0.21	0.36	J	0.21	0.31	J	0.21	0.97		0.22
Perfluorooctanoic acid (PFOA)	ug/kg	0.29		0.094	0.093	U	0.093	0.09	U	0.09	0.091	U	0.091	0.088	U	0.088	0.17	J	0.095
Perfluoropentanoic acid (PFPeA)	ug/kg	0.084	U	0.084	0.084	U	0.084	0.08	U	0.08	0.082	U	0.082	0.079	U	0.079	0.11	J	0.085
Perfluorotetradecanoic acid (PFTeA)	ug/kg	0.059	U	0.059	0.059	U	0.059	0.056	U	0.056	0.057	U	0.057	0.055	U	0.055	0.059	U	0.059
Perfluorotridecanoic acid (PFTriA)	ug/kg	0.055	U	0.055	0.055	U	0.055	0.053	U	0.053	0.054	U	0.054	0.052	U	0.052	0.056	U	0.056
Perfluoroundecanoic acid (PFUnA)	ug/kg	0.039	U	0.039	0.039	U	0.039	0.038	U	0.038	0.038	U	0.038	0.037	U	0.037	0.04	U	0.04
Total PFAS (Excluding PFOS & PFOA)	ug/kg	0.82			0.037			0.041			0.043			0.037			0.408		
Total PFAS	ug/kg	1.11			0.037			0.041			0.403			0.347			1.548		

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

ug/kg - micrograms per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory MDL

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1F
 Summary of Soil/Fill Sampling Results
 PFAS
 1510 Broadway, Brooklyn, NY

Sample ID		SB-34 (9-9.5)			SB-34 (13-13.5)			SB-34 (15.5-16.0)			SB-35 (4.5-5.0)			SB-35 (19-19.5)			SB-35 (8-8.5)		
Lab Sample ID		460-182440-26			460-182440-27			460-182440-28			460-182440-29			460-182440-30			460-182440-31		
Sampling Date/Time		05/20/2019 12:05:00			05/20/2019 12:10:00			05/20/2019 12:15:00			05/20/2019 12:20:00			05/20/2019 12:35:00			05/20/2019 12:25:00		
Sample Matrix		Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
FLUORINATED ALKYL SUBSTANCES																			
6:2 FTS	ug/kg	0.17	U	0.17	0.17	U	0.17	0.16	U	0.16	0.18	U	0.18	0.15	U	0.15	0.16	U	0.16
8:2 FTS	ug/kg	0.29	U	0.29	0.28	U	0.28	0.26	U	0.26	0.29	U	0.29	0.25	U	0.25	0.27	U	0.27
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ug/kg	0.43	U	0.43	0.41	U	0.41	0.39	U	0.39	0.44	U	0.44	0.37	U	0.37	0.4	U	0.4
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ug/kg	0.45	U	0.45	0.44	U	0.44	0.41	U	0.41	0.46	U	0.46	0.39	U	0.39	0.42	U	0.42
Perfluorobutanesulfonic acid (PFBS)	ug/kg	0.029	U	0.029	0.028	U	0.028	0.026	U	0.026	0.029	U	0.029	0.025	U	0.025	0.027	U	0.027
Perfluorobutanoic acid (PFBA)	ug/kg	0.036	J B	0.032	0.031	U	0.031	0.03	U	0.03	0.18	J B	0.033	0.045	J B	0.028	0.088	J B	0.03
Perfluorodecanesulfonic acid (PFDS)	ug/kg	0.045	U	0.045	0.044	U	0.044	0.041	U	0.041	0.046	U	0.046	0.039	U	0.039	0.042	U	0.042
Perfluorodecanoic acid (PFDA)	ug/kg	0.025	U	0.025	0.025	U	0.025	0.023	U	0.023	0.11	J	0.026	0.022	U	0.022	0.024	U	0.024
Perfluorododecanoic acid (PFDoA)	ug/kg	0.077	U	0.077	0.075	U	0.075	0.071	U	0.071	0.079	U	0.079	0.068	U	0.068	0.073	U	0.073
Perfluoroheptanesulfonic Acid (PFHpS)	ug/kg	0.04	U	0.04	0.039	U	0.039	0.037	U	0.037	0.041	U	0.041	0.035	U	0.035	0.038	U	0.038
Perfluoroheptanoic acid (PFHpA)	ug/kg	0.033	U	0.033	0.032	U	0.032	0.031	U	0.031	0.14	J	0.034	0.029	U	0.029	0.046	J	0.032
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	0.036	U	0.036	0.035	U	0.035	0.033	U	0.033	0.038	J	0.037	0.031	U	0.031	0.034	U	0.034
Perfluorohexanoic acid (PFHxA)	ug/kg	0.048	U	0.048	0.047	U	0.047	0.044	U	0.044	0.19	J	0.05	0.042	U	0.042	0.046	U	0.046
Perfluorononanoic acid (PFNA)	ug/kg	0.041	U	0.041	0.04	U	0.04	0.038	U	0.038	0.16	J	0.042	0.036	U	0.036	0.039	U	0.039
Perfluorooctanesulfonamide (FOSA)	ug/kg	0.094	U	0.094	0.092	U	0.092	0.086	U	0.086	0.097	U	0.097	0.083	U	0.083	0.089	U	0.089
Perfluorooctanesulfonic acid (PFOS)	ug/kg	0.43	J	0.23	0.22	U	0.22	0.21	U	0.21	2.1		0.24	0.2	U	0.2	0.73		0.22
Perfluorooctanoic acid (PFOA)	ug/kg	0.13	J	0.099	0.15	J	0.096	0.13	J	0.091	0.35		0.1	0.087	U	0.087	0.33		0.094
Perfluoropentanoic acid (PFPeA)	ug/kg	0.089	U	0.089	0.086	U	0.086	0.081	U	0.081	0.33		0.091	0.078	U	0.078	0.084	U	0.084
Perfluorotetradecanoic acid (PFTeA)	ug/kg	0.062	U	0.062	0.06	U	0.06	0.057	U	0.057	0.064	U	0.064	0.055	U	0.055	0.059	U	0.059
Perfluorotridecanoic acid (PFTriA)	ug/kg	0.059	U	0.059	0.057	U	0.057	0.054	U	0.054	0.06	U	0.06	0.052	U	0.052	0.055	U	0.055
Perfluoroundecanoic acid (PFUnA)	ug/kg	0.041	U	0.041	0.04	U	0.04	0.038	U	0.038	0.065	J	0.042	0.036	U	0.036	0.039	U	0.039
Total PFAS (Excluding PFOS & PFOA)	ug/kg	0.036			0			0			1.213			0.045			0.134		
Total PFAS	ug/kg	0.596			0.15			0.13			3.663			0.045			1.194		

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

ug/kg - micrograms per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory MDL

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1F
 Summary of Soil/Fill Sampling Results
 PFAS
 1510 Broadway, Brooklyn, NY

Sample ID		SB-35 (13.5-14.0)			SB-36 (2-2.5)			SB-36 (6-6.5)			SB-36 (13-13.5)			SB-36 (17-17.5)			TP-5(4.5-5.0)			
Lab Sample ID		460-182440-32			460-182440-33			460-182440-34			460-182440-35			460-182440-36			460-182779-1			
Sampling Date/Time		05/20/2019 12:30:00			05/20/2019 12:40:00			05/20/2019 12:45:00			05/20/2019 12:50:00			05/20/2019 12:55:00			05/23/2019 12:20:00			
Sample Matrix		Soil			Soil			Soil			Soil			Soil			Soil			
Analyte	Units	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
FLUORINATED ALKYL SUBSTANCES																				
6:2 FTS	ug/kg	0.15	U	0.15	0.18	U	0.18	0.66	J	0.18	0.4	J	0.16	0.15	U	0.15	0.17	U	0.17	
8:2 FTS	ug/kg	0.25	U	0.25	0.3	U	0.3	0.3	U	0.3	0.27	U	0.27	0.26	U	0.26	0.28	U	0.28	
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ug/kg	0.37	U	0.37	0.45	U	0.45	0.44	U	0.44	0.41	U	0.41	0.38	U	0.38	0.41	U	0.41	
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ug/kg	0.4	U	0.4	0.47	U	0.47	0.46	U	0.46	0.43	U	0.43	0.4	U	0.4	0.44	U	0.44	
Perfluorobutanesulfonic acid (PFBS)	ug/kg	0.025	U	0.025	0.03	U	0.03	0.03	U	0.03	0.027	U	0.027	0.026	U	0.026	0.03	U	0.03	
Perfluorobutanoic acid (PFBA)	ug/kg	0.028	U	0.028	0.047	J B	0.034	0.092	J B	0.033	0.031	U	0.031	0.069	J B	0.029	0.03	U	0.03	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	0.04	U	0.04	0.047	U	0.047	0.046	U	0.046	0.043	U	0.043	0.04	U	0.04	0.04	U	0.04	
Perfluorodecanoic acid (PFDA)	ug/kg	0.022	U	0.022	0.056	J	0.027	0.026	U	0.026	0.024	U	0.024	0.023	U	0.023	0.05	J	0.03	
Perfluorododecanoic acid (PFDoA)	ug/kg	0.068	U	0.068	0.081	U	0.081	0.079	U	0.079	0.073	U	0.073	0.069	U	0.069	0.08	U	0.08	
Perfluoroheptanesulfonic Acid (PFHpS)	ug/kg	0.035	U	0.035	0.042	U	0.042	0.041	U	0.041	0.038	U	0.038	0.036	U	0.036	0.04	U	0.04	
Perfluoroheptanoic acid (PFHpA)	ug/kg	0.029	U	0.029	0.042	J	0.035	0.034	U	0.034	0.032	U	0.032	0.03	U	0.03	0.04	J	0.03	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	0.031	U	0.031	0.038	U	0.038	0.037	U	0.037	0.034	U	0.034	0.032	U	0.032	0.04	U	0.04	
Perfluorohexanoic acid (PFHxA)	ug/kg	0.043	U	0.043	0.051	U	0.051	0.052	J	0.05	0.046	U	0.046	0.043	U	0.043	0.05	U	0.05	
Perfluorononanoic acid (PFNA)	ug/kg	0.036	U	0.036	0.069	J	0.044	0.043	U	0.043	0.07	J	0.039	0.037	U	0.037	0.10	J	0.04	
Perfluorooctanesulfonamide (FOSA)	ug/kg	0.083	U	0.083	0.099	U	0.099	0.097	U	0.097	0.09	U	0.09	0.084	U	0.084	0.09	U	0.09	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	0.2	U	0.2	1.8		0.24	0.24	U	0.24	1.2		0.22	0.2	U	0.2	1.20		0.22	
Perfluorooctanoic acid (PFOA)	ug/kg	0.087	U	0.087	0.41		0.1	0.1	J	0.1	0.67		0.094	0.088	U	0.088	0.19	J	0.10	
Perfluoropentanoic acid (PFPeA)	ug/kg	0.078	U	0.078	0.093	U	0.093	0.091	U	0.091	0.084	U	0.084	0.079	U	0.079	0.09	U	0.09	
Perfluorotetradecanoic acid (PFTeA)	ug/kg	0.055	U	0.055	0.065	U	0.065	0.064	U	0.064	0.059	U	0.059	0.055	U	0.055	0.06	U	0.06	
Perfluorotridecanoic acid (PFTriA)	ug/kg	0.052	U	0.052	0.062	U	0.062	0.06	U	0.06	0.056	U	0.056	0.052	U	0.052	0.06	U	0.06	
Perfluoroundecanoic acid (PFUnA)	ug/kg	0.036	U	0.036	0.044	U	0.044	0.043	U	0.043	0.039	U	0.039	0.037	U	0.037	0.04	U	0.04	
Total PFAS (Excluding PFOS & PFOA)	ug/kg	0			0.214			0.144			0.07			0.069			0.18			
Total PFAS	ug/kg	0			2.424			0.244			1.94			0.069			1.57			

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

ug/kg - micrograms per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory MDL

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1F
 Summary of Soil/Fill Sampling Results
 PFAS
 1510 Broadway, Brooklyn, NY

Sample ID		TP-5(9.5-10.0)			TP-5(12-12.5)			TP-6(4.5-5.0)			TP-6(9-9.5)			TP-6(11-11.5)			TP-7(4.5-5.0)		
Lab Sample ID		460-182779-2			460-182779-3			460-182779-4			460-182779-5			460-182779-6			460-182779-7		
Sampling Date/Time		05/23/2019 12:35:00			05/23/2019 12:45:00			05/23/2019 14:30:00			05/23/2019 14:35:00			05/23/2019 14:45:00			05/23/2019 12:55:00		
Sample Matrix		Soil			Soil			Soil			Soil			Soil			Soil		
Analyte	Units	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
FLUORINATED ALKYL SUBSTANCES																			
6:2 FTS	ug/kg	0.16	U	0.16	0.16	U	0.16	0.15	U	0.15	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17
8:2 FTS	ug/kg	0.26	U	0.26	0.27	U	0.27	0.25	U	0.25	0.28	U	0.28	0.28	U	0.28	3.10		0.28
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ug/kg	0.39	U	0.39	0.40	U	0.40	0.37	U	0.37	0.42	U	0.42	0.42	U	0.42	0.41	U	0.41
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ug/kg	0.41	U	0.41	0.42	U	0.42	0.39	U	0.39	0.44	U	0.44	0.44	U	0.44	0.43	U	0.43
Perfluorobutanesulfonic acid (PFBS)	ug/kg	0.03	U	0.03	0.03	U	0.03	0.03	U	0.03	0.03	U	0.03	0.03	U	0.03	0.03	U	0.03
Perfluorobutanoic acid (PFBA)	ug/kg	0.03	U	0.03	0.03	U	0.03	0.03	U	0.03	0.03	U	0.03	0.06	J B	0.03	0.03	U	0.03
Perfluorodecanesulfonic acid (PFDS)	ug/kg	0.04	U	0.04	0.04	U	0.04	0.04	U	0.04	0.04	U	0.04	0.04	U	0.04	0.04	U	0.04
Perfluorodecanoic acid (PFDA)	ug/kg	0.02	U	0.02	0.02	U	0.02	0.13	J	0.02	0.03	U	0.03	0.03	U	0.03	0.14	J	0.02
Perfluorododecanoic acid (PFDoA)	ug/kg	0.07	U	0.07	0.07	U	0.07	0.07	U	0.07	0.08	U	0.08	0.08	U	0.08	0.08	U	0.08
Perfluoroheptanesulfonic Acid (PFHpS)	ug/kg	0.04	U	0.04	0.04	U	0.04	0.04	U	0.04	0.04	U	0.04	0.04	U	0.04	0.04	U	0.04
Perfluoroheptanoic acid (PFHpA)	ug/kg	0.08	J	0.03	0.03	U	0.03	0.46		0.03	0.39		0.03	0.03	U	0.03	0.44		0.03
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	0.05	J	0.03	0.03	U	0.03	0.03	U	0.03	0.04	U	0.04	0.04	U	0.04	0.10	J	0.03
Perfluorohexanoic acid (PFHxA)	ug/kg	0.04	U	0.04	0.05	U	0.05	0.55		0.04	0.05	U	0.05	0.05	U	0.05	0.29		0.05
Perfluorononanoic acid (PFNA)	ug/kg	0.04	U	0.04	0.04	U	0.04	0.56		0.04	0.22	J	0.04	0.04	U	0.04	0.67		0.04
Perfluorooctanesulfonamide (FOSA)	ug/kg	0.09	U	0.09	0.09	U	0.09	0.08	U	0.08	0.09	U	0.09	0.09	U	0.09	0.09	U	0.09
Perfluorooctanesulfonic acid (PFOS)	ug/kg	1.30		0.21	0.21	U	0.21	7.00		0.20	3.80		0.23	0.26	J	0.23	3.10		0.22
Perfluorooctanoic acid (PFOA)	ug/kg	0.46		0.09	0.16	J	0.09	1.90		0.09	1.70		0.10	0.13	J	0.10	0.59		0.10
Perfluoropentanoic acid (PFPeA)	ug/kg	0.08	U	0.08	0.08	U	0.08	0.67		0.08	0.09	U	0.09	0.09	U	0.09	0.30	U G	0.30
Perfluorotetradecanoic acid (PFTeA)	ug/kg	0.06	U	0.06	0.06	U	0.06	0.05	U	0.05	0.06	U	0.06	0.06	U	0.06	0.06	U	0.06
Perfluorotridecanoic acid (PFTriA)	ug/kg	0.05	U	0.05	0.06	U	0.06	0.05	U	0.05	0.06	U	0.06	0.06	U	0.06	0.06	U	0.06
Perfluoroundecanoic acid (PFUnA)	ug/kg	0.04	U	0.04	0.04	U	0.04	0.04	U	0.04	0.04	U	0.04	0.04	U	0.04	0.06	J	0.04
Total PFAS (Excluding PFOS & PFOA)	ug/kg	0.13			0			2.37			0.61			0.06			4.80		
Total PFAS	ug/kg	1.89			0.16			11.27			6.11			0.45			8.49		

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

ug/kg - micrograms per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory MDL

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 1F
Summary of Soil/Fill Sampling Results
PFAS
1510 Broadway, Brooklyn, NY

Sample ID		TP-7(8-8.5)			TP-7(10-10.5)			DUP-1			DUP-2			DUP-3		
Lab Sample ID		460-182779-8			460-182779-9			460-182440-37			460-182616-9			460-182722-21		
Sampling Date/Time		05/23/2019 13:05:00			05/23/2019 13:15:00			05/20/2019 00:00:00			05/21/2019 00:00:00			05/22/2019 00:00:00		
Sample Matrix		Soil			Soil			Soil			Soil			Soil		
Analyte	Units	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
FLUORINATED ALKYL SUBSTANCES																
6:2 FTS	ug/kg	0.20	U	0.20	0.18	U	0.18	0.15	U	0.15	0.17	U	0.17	0.17	U	0.17
8:2 FTS	ug/kg	2.80		0.33	0.30	U	0.30	0.25	U	0.25	0.28	U	0.28	0.28	U	0.28
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ug/kg	0.49	U	0.49	0.45	U	0.45	0.37	U	0.37	0.41	U	0.41	0.42	U	0.42
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ug/kg	0.52	U	0.52	0.47	U	0.47	0.39	U	0.39	0.44	U	0.44	0.44	U	0.44
Perfluorobutanesulfonic acid (PFBS)	ug/kg	0.03	U	0.03	0.03	U	0.03	0.025	U	0.025	0.028	U	0.028	0.028	U	0.028
Perfluorobutanoic acid (PFBA)	ug/kg	0.04	U	0.04	0.03	U	0.03	0.072	J B	0.028	0.075	J B	0.031	0.065	J B	0.032
Perfluorodecanesulfonic acid (PFDS)	ug/kg	0.05	U	0.05	0.05	U	0.05	0.039	U	0.039	0.044	U	0.044	0.044	U	0.044
Perfluorodecanoic acid (PFDA)	ug/kg	0.17	J	0.03	0.03	U	0.03	0.022	U	0.022	0.025	U	0.025	0.025	U	0.025
Perfluorododecanoic acid (PFDoA)	ug/kg	0.09	U	0.09	0.08	U	0.08	0.067	U	0.067	0.075	U	0.075	0.076	U	0.076
Perfluoroheptanesulfonic Acid (PFHpS)	ug/kg	0.05	U	0.05	0.04	U	0.04	0.035	U	0.035	0.039	U	0.039	0.039	U	0.039
Perfluoroheptanoic acid (PFHpA)	ug/kg	0.84		0.04	0.43		0.04	0.029	U	0.029	0.032	U	0.032	0.033	U	0.033
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	0.06	J	0.04	0.04	J	0.04	0.031	U	0.031	0.035	U	0.035	0.035	U	0.035
Perfluorohexanoic acid (PFHxA)	ug/kg	0.37		0.06	0.05	U	0.05	0.042	U	0.042	0.047	U	0.047	0.047	U	0.047
Perfluorononanoic acid (PFNA)	ug/kg	1.10		0.05	0.26		0.04	0.036	U	0.036	0.04	U	0.04	0.041	U	0.041
Perfluorooctanesulfonamide (FOSA)	ug/kg	0.11	U	0.11	0.10	U	0.10	0.081	U	0.081	0.092	U	0.092	0.093	U	0.093
Perfluorooctanesulfonic acid (PFOS)	ug/kg	4.10		0.27	1.60		0.24	0.2	U	0.2	0.56		0.22	0.23	U	0.23
Perfluorooctanoic acid (PFOA)	ug/kg	1.60		0.11	1.50		0.10	0.085	U	0.085	0.11	J	0.096	0.097	U	0.097
Perfluoropentanoic acid (PFPeA)	ug/kg	0.10	U	0.10	0.09	U	0.09	0.076	U	0.076	0.086	U	0.086	0.087	U	0.087
Perfluorotetradecanoic acid (PFTeA)	ug/kg	0.07	U	0.07	0.07	U	0.07	0.054	U	0.054	0.06	U	0.06	0.061	U	0.061
Perfluorotridecanoic acid (PFTriA)	ug/kg	0.07	U	0.07	0.06	U	0.06	0.051	U	0.051	0.057	U	0.057	0.058	U	0.058
Perfluoroundecanoic acid (PFUnA)	ug/kg	0.05	U	0.05	0.04	U	0.04	0.036	U	0.036	0.04	U	0.04	0.041	U	0.041
Total PFAS (Excluding PFOS & PFOA)	ug/kg	5.34			0.73			0.072			0.075			0.065		
Total PFAS	ug/kg	11.04			3.83			0.072			0.745			0.065		

Notes:

SB-14(3-3.5) - Sample ID(Sample Depth)

ug/kg - micrograms per kilogram

Q - Laboratory Qualifier

BOLD - Constituent detected above laboratory MDL

MDL - Minimum Detection Limit

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the constituent was analyzed for but not detected

B - Constituent was found in the laboratory blank and the sample

Table 2A
 Summary of Groundwater Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-1S			MW-1D			MW-2			MW-3			MW-4			MW-5			
Lab Sample ID			460-183847-3			460-183502-2			460-183502-1			460-183551-2			460-183875-1			460-183551-1			
Sampling Date/Time			06/05/2019 12:25:00			6/3/2019			6/3/2019			6/4/2019			6/6/2019			6/4/2019			
Matrix			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
VOLATILES																					
1,1,1-Trichloroethane	ug/L	5	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	
1,1,2,2-Tetrachloroethane	ug/L	5	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	
1,1,2-Trichloroethane	ug/L	1	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	
1,1-Dichloroethane	ug/L	5	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	
1,1-Dichloroethene	ug/L	5	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	
1,2,3-Trichlorobenzene	ug/L	5	0.36	U	0.36	0.36	U	0.36	0.36	U	0.36	0.36	U	0.36	0.36	U	0.36	0.36	U	0.36	
1,2,4-Trichlorobenzene	ug/L	5	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	
1,2-Dibromo-3-Chloropropane	ug/L	0.04	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	
1,2-Dibromoethane	ug/L	0.0006	0.22	J	0.2	0.001	U	0.001	0.001	U	0.001	0.5	U	0.5	0.5	U	0.5	0.5	U	0.5	
1,2-Dichlorobenzene	ug/L	3	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	
1,2-Dichloroethane	ug/L	0.6	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	
1,2-Dichloropropane	ug/L	5	0.35	U	0.35	0.35	U	0.35	0.35	U	0.35	0.35	U	0.35	0.35	U	0.35	0.35	U	0.35	
1,3-Dichlorobenzene	ug/L	3	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	
1,4-Dichlorobenzene	ug/L	3	0.33	U	0.33	0.33	U	0.33	0.33	U	0.33	0.33	U	0.33	0.33	U	0.33	0.33	U	0.33	
1,4 - Dioxane	ug/L	NA	0.22	J	0.2	0.2	U	0.2	0.2	U	0.2	28	U	28	28	U	28	28	U	28	
2-Butanone	ug/L	NA	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	
2-Hexanone	ug/L	NA	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	
4-Methyl-2-pentanone	ug/L	NA	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	
Acetone	ug/L	NA	4.4	U	4.4	4.4	U	4.4	4.4	U	4.4	4.4	U	4.4	4.4	U	4.4	4.4	U	4.4	
Benzene	ug/L	1	0.2	U	0.2	0.2	U	0.2	0.2	U	0.2	0.2	U	0.2	0.2	U	0.2	0.2	U	0.2	
Bromochloromethane	ug/L	5	0.41	U	0.41	0.41	U	0.41	0.41	U	0.41	0.41	U	0.41	0.41	U	0.41	0.41	U	0.41	
Bromodichloromethane	ug/L	NA	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	0.98	J	0.34	
Bromoform	ug/L	NA	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54	
Bromomethane	ug/L	5	0.55	U	0.55	0.55	U	0.55	0.55	U	0.55	0.55	U	0.55	0.55	U	0.55	0.55	U	0.55	

Table 2A
 Summary of Groundwater Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-1S			MW-1D			MW-2			MW-3			MW-4			MW-5		
Lab Sample ID			460-183847-3			460-183502-2			460-183502-1			460-183551-2			460-183875-1			460-183551-1		
Sampling Date/Time			06/05/2019 12:25:00			6/3/2019			6/3/2019			6/4/2019			6/6/2019			6/4/2019		
Matrix			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater		
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
Carbon disulfide	ug/L	NA	0.82	U*	0.82	0.82	U	0.82	0.82	U	0.82	0.82	U	0.82	0.82	U	0.82	0.82	U	0.82
Carbon tetrachloride	ug/L	5	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21
Chlorobenzene	ug/L	5	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38
Chloroethane	ug/L	5	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32
Chloroform	ug/L	7	0.96	J	0.33	1.6		0.33	0.9	J	0.33	0.59	J	0.33	3.8		0.33	26		0.33
Chloromethane	ug/L	5	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	U*	0.4	0.4	U	0.4	
cis-1,2-Dichloroethene	ug/L	5	0.22	U	0.22	0.22	U	0.22	0.22	U	0.22	0.22	U	0.22	U	0.22	0.22	U	0.22	
cis-1,3-Dichloropropene	ug/L	NA	0.22	U	0.22	0.22	U	0.22	0.22	U	0.22	0.22	U	0.22	U	0.22	0.22	U	0.22	
Cyclohexane	ug/L	NA	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	U	0.32	0.32	U	0.32	
Dibromochloromethane	ug/L	NA	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	U	0.28	0.28	U	0.28	
Dichlorodifluoromethane	ug/L	5	0.31	U	0.31	0.31	U	0.31	0.31	U	0.31	0.31	U	0.31	U*	0.31	0.31	U	0.31	
Ethylbenzene	ug/L	5	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	U	0.3	0.3	U	0.3	
Ethylene Dibromide	ug/L	0.0006	0.001	U	0.001	~	~	~	~	~	~	~	~	~	~	~	~	~	~	
Freon TF	ug/L	5	0.31	U	0.31	0.31	U	0.31	0.31	U	0.31	0.31	U	0.31	U	0.31	0.31	U	0.31	
Isopropylbenzene	ug/L	5	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	U	0.34	0.34	U	0.34	
m&p-Xylene	ug/L	NA	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	U	0.3	0.3	U	0.3	
Methyl acetate	ug/L	NA	0.79	U	0.79	0.79	U	0.79	0.79	U	0.79	0.79	U	0.79	U	0.79	0.79	U	0.79	
Methylcyclohexane	ug/L	NA	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	U	0.26	0.26	U	0.26	
Methylene Chloride	ug/L	5	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	U	0.32	0.32	U	0.32	
MTBE	ug/L	10	0.47	U	0.47	0.47	U	0.47	0.47	U	0.47	0.47	U	0.47	U	0.47	0.47	U	0.47	
o-Xylene	ug/L	5	0.36	U	0.36	0.36	U	0.36	0.36	U	0.36	0.36	U	0.36	U	0.36	0.36	U	0.36	
Styrene	ug/L	5	0.42	U	0.42	0.42	U	0.42	0.42	U	0.42	0.42	U	0.42	U	0.42	0.42	U	0.42	
Tetrachloroethene	ug/L	5	22		0.25	34		0.25	19		0.25	13		0.25	26		0.25	2.9		0.25

Table 2A
 Summary of Groundwater Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID			MW-1S			MW-1D			MW-2			MW-3			MW-4			MW-5		
Lab Sample ID		NYSDEC AWQS	460-183847-3			460-183502-2			460-183502-1			460-183551-2			460-183875-1			460-183551-1		
Sampling Date/Time			06/05/2019 12:25:00			6/3/2019			6/3/2019			6/4/2019			6/6/2019			6/4/2019		
Matrix			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater		
Units			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
Toluene	ug/L	5	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38
trans-1,2-Dichloroethene	ug/L	5	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24
trans-1,3-Dichloropropene	ug/L	NA	0.49	U	0.49	0.49	U	0.49	0.49	U	0.49	0.49	U	0.49	0.49	U	0.49	0.49	U	0.49
Trichloroethene	ug/L	5	0.66	J	0.31	0.98	J	0.31	0.74	J	0.31	0.5	J	0.31	0.66	J	0.31	0.31	U	0.31
Trichlorofluoromethane	ug/L	5	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32
Vinyl chloride	ug/L	2	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	0.17	U*	0.17	0.17	U	0.17

Notes:

AWQS - NYSDEC Ambient Water Quality Standards

ug/L - micrograms per liter

NA - Not Applicable/No Standard

MDL - Minimum Detection Limit

Q - Qualifier

Bold - Constituent detected above the MDL

Detected above the NYSDEC AWQS

* - RPD of the LCS and LCSD exceeds the control Limits

greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the analyte was analyzed for but not Detected

Table 2A
 Summary of Groundwater Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-6			MW-7			MW-11			FB			DUP			
Lab Sample ID			460-183502-3			460-183847-1			460-183847-2			460-183875-2			460-183847-5			
Sampling Date/Time			6/3/2019			6/5/2019			6/5/2019			06/06/2019 09:10:00			06/05/2019 00:00:00			
Matrix			Groundwater			Groundwater			Groundwater			Water			Water			
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
VOLATILES																		
1,1,1-Trichloroethane	ug/L	5	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24
1,1,2,2-Tetrachloroethane	ug/L	5	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	0.37
1,1,2-Trichloroethane	ug/L	1	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43
1,1-Dichloroethane	ug/L	5	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26
1,1-Dichloroethene	ug/L	5	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26
1,2,3-Trichlorobenzene	ug/L	5	0.36	U	0.36	0.36	U	0.36	0.36	U	0.36	0.36	U	0.36	0.36	U	0.36	0.36
1,2,4-Trichlorobenzene	ug/L	5	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	0.37
1,2-Dibromo-3-Chloropropane	ug/L	0.04	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.38	U	0.38		
1,2-Dibromoethane	ug/L	0.0006	0.001	U	0.001	0.2	J	0.2	0.2	U	0.2	0.5	U	0.5				
1,2-Dichlorobenzene	ug/L	3	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43
1,2-Dichloroethane	ug/L	0.6	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43
1,2-Dichloropropane	ug/L	5	0.35	U	0.35	0.35	U	0.35	0.35	U	0.35	0.35	U	0.35	0.35	U	0.35	0.35
1,3-Dichlorobenzene	ug/L	3	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	0.34
1,4-Dichlorobenzene	ug/L	3	0.33	U	0.33	0.33	U	0.33	0.33	U	0.33	0.33	U	0.33	0.33	U	0.33	0.33
1,4 - Dioxane	ug/L	NA	0.2	U	0.2	~		~	~	~	~	28	U	28				
2-Butanone	ug/L	NA	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.9
2-Hexanone	ug/L	NA	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1
4-Methyl-2-pentanone	ug/L	NA	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	1.3
Acetone	ug/L	NA	4.4	U	4.4	4.4	U	4.4	4.4	U	4.4	4.4	U	4.4	4.4	U	4.4	4.4
Benzene	ug/L	1	0.2	U	0.2	0.2	U	0.2	0.2	U	0.2	0.2	U	0.2	0.2	U	0.2	0.2
Bromochloromethane	ug/L	5	0.41	U	0.41	0.41	U	0.41	0.41	U	0.41	0.41	U	0.41	0.41	U	0.41	0.41
Bromodichloromethane	ug/L	NA	0.34	U	0.34	0.34	U	0.34	2.2		0.34	0.34	U	0.34	0.34	U	0.34	0.34
Bromoform	ug/L	NA	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54	0.54
Bromomethane	ug/L	5	0.55	U	0.55	0.55	U	0.55	0.55	U	0.55	0.55	U	0.55	0.55	U	0.55	0.55

Table 2A
 Summary of Groundwater Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-6			MW-7			MW-11			FB			DUP		
Lab Sample ID			460-183502-3			460-183847-1			460-183847-2			460-183875-2			460-183847-5		
Sampling Date/Time			6/3/2019			6/5/2019			6/5/2019			06/06/2019 09:10:00			06/05/2019 00:00:00		
Matrix			Groundwater			Groundwater			Groundwater			Water			Water		
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
Carbon disulfide	ug/L	NA	0.82	U	0.82	0.82	U *	0.82	0.82	U	0.82	0.82	U	0.82	0.82	U *	0.82
Carbon tetrachloride	ug/L	5	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21
Chlorobenzene	ug/L	5	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38
Chloroethane	ug/L	5	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32
Chloroform	ug/L	7	3.5		0.33	12		0.33	36		0.33	0.33	U	0.33	1		0.33
Chloromethane	ug/L	5	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U *	0.4	0.4	U	0.4
cis-1,2-Dichloroethene	ug/L	5	0.22	U	0.22	0.22	U	0.22	0.22	U	0.22	0.22	U	0.22	0.22	U	0.22
cis-1,3-Dichloropropene	ug/L	NA	0.22	U	0.22	0.22	U	0.22	0.22	U	0.22	0.22	U	0.22	0.22	U	0.22
Cyclohexane	ug/L	NA	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32
Dibromochloromethane	ug/L	NA	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28
Dichlorodifluoromethane	ug/L	5	0.31	U	0.31	0.31	U	0.31	0.31	U	0.31	0.31	U *	0.31	0.31	U	0.31
Ethylbenzene	ug/L	5	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
Ethylene Dibromide	ug/L	0.0006	~	~	~	0.001	U	0.001	0.001	U	0.001				~	~	~
Freon TF	ug/L	5	0.31	U	0.31	0.34	U	0.31	0.31	U	0.31	0.31	U	0.31	0.31	U	0.31
Isopropylbenzene	ug/L	5	0.34	U	0.34	0.3	U	0.34	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34
m&p-Xylene	ug/L	NA	0.3	U	0.3	0.79	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
Methyl acetate	ug/L	NA	0.79	U	0.79	0.26	U	0.79	0.79	U	0.79	0.79	U	0.79	0.79	U	0.79
Methylcyclohexane	ug/L	NA	0.26	U	0.26	0.32	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26
Methylene Chloride	ug/L	5	0.32	U	0.32	0.47	U	0.32	0.35	J	0.32	0.32	U	0.32	0.32	U	0.32
MTBE	ug/L	10	0.47	U	0.47	0.36	U	0.47	0.47	U	0.47	0.47	U	0.47	0.47	U	0.47
o-Xylene	ug/L	5	0.36	U	0.36	0.42	U	0.36	0.36	U	0.36	0.36	U	0.36	0.36	U	0.36
Styrene	ug/L	5	0.42	U	0.42	21		0.42	0.42	U	0.42	0.42	U	0.42	0.42	U	0.42
Tetrachloroethene	ug/L	5	33		0.25	0.38	U	21	0.67	J	0.25	0.25	U	0.25	25		0.25

Table 2A
 Summary of Groundwater Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-6			MW-7			MW-11			FB			DUP		
Lab Sample ID			460-183502-3			460-183847-1			460-183847-2			460-183875-2			460-183847-5		
Sampling Date/Time			6/3/2019			6/5/2019			6/5/2019			06/06/2019 09:10:00			06/05/2019 00:00:00		
Matrix			Groundwater			Groundwater			Groundwater			Water			Water		
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
Toluene	ug/L	5	0.38	U	0.38	0.24	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38
trans-1,2-Dichloroethene	ug/L	5	0.24	U	0.24	0.49	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24
trans-1,3-Dichloropropene	ug/L	NA	0.49	U	0.49	0.42	J	0.49	0.49	U	0.49	0.49	U	0.49	0.49	U	0.49
Trichloroethene	ug/L	5	0.89	J	0.31	0.32	U	0.42	0.31	U	0.31	0.31	U	0.31	0.79	J	0.31
Trichlorofluoromethane	ug/L	5	0.32	U	0.32	0.17	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32
Vinyl chloride	ug/L	2	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	0.17	U*	0.17	0.17	U	0.17

Notes:

AWQS - NYSDEC Ambient Water Quality Standards

ug/L - micrograms per liter

NA - Not Applicable/No Standard

MDL - Minimum Detection Limit

Q - Qualifier

Bold - Constituent detected above the MDL

Detected above the NYSDEC AWQS

* - RPD of the LCS and LCSD exceeds the control Limits

greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the analyte was analyzed for but not Detected

Table 2A
 Summary of Groundwater Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-8			MW-9			MW-10			DUP (MW-10)			
Lab Sample ID			460-203805-2			460-203805-3			460-203805-1			460-203805-4			
Sampling Date/Time			02/25/2020 10:15:00			02/25/2020 11:40:00			02/25/2020 09:05:00			02/25/2020 00:00:00			
Matrix			Groundwater			Groundwater			Groundwater			Groundwater			
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
Volatiles															
1,1,1-Trichloroethane	ug/L	5	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	
1,1,1,2-Tetrachloroethane	ug/L	5	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	
1,1,2-Trichloroethane	ug/L	NA	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	
1,1-Dichloroethane	ug/L	5	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	
1,1-Dichloroethene	ug/L	5	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	
1,2,3-Trichlorobenzene	ug/L	NA	0.36	U	0.36	0.36	U	0.36	0.36	U	0.36	0.36	U	0.36	
1,2,4-Trichlorobenzene	ug/L	5	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	0.37	U	0.37	
1,2-Dibromo-3-Chloropropane	ug/L	NA	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	
1,2-Dibromoethane	ug/L	NA	0.5	U	0.5	0.5	U	0.5	0.5	U	0.5	0.5	U	0.5	
1,2-Dichlorobenzene	ug/L	4.7	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	
1,2-Dichloroethane	ug/L	5	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	
1,2-Dichloropropane	ug/L	NA	0.35	U	0.35	0.35	U	0.35	0.35	U	0.35	0.35	U	0.35	
1,3-Dichlorobenzene	ug/L	5	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	
1,4-Dichlorobenzene	ug/L	5	0.33	U	0.33	0.33	U	0.33	0.33	U	0.33	0.33	U	0.33	
1,4-Dioxane	ug/L	NA	28	U	28	28	U	28	28	U	28	28	U	28	
2-Butanone	ug/L	50	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	
2-Hexanone	ug/L	NA	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	
4-Methyl-2-pentanone	ug/L	50	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	
Acetone	ug/L	50	4.4	U	4.4	4.4	U	4.4	4.4	U	4.4	4.4	U	4.4	
Benzene	ug/L	0.7	0.2	U	0.2	0.2	U	0.2	0.2	U	0.2	0.2	U	0.2	
Bromochloromethane	ug/L	NA	0.41	U	0.41	0.41	U	0.41	0.41	U	0.41	0.41	U	0.41	
Bromodichloromethane	ug/L	NA	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	
Bromoform	ug/L	NA	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54	
Bromomethane	ug/L	NA	0.55	U	0.55	0.55	U	0.55	0.55	U	0.55	0.55	U	0.55	
Carbon disulfide	ug/L	50	0.82	U	0.82	0.82	U	0.82	0.82	U	0.82	0.82	U	0.82	
Carbon tetrachloride	ug/L	5	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	
Chlorobenzene	ug/L	5	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	
Chloroethane	ug/L	50	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	
Chloroform	ug/L	7	1.1		0.33	2.9		0.33	20		0.33	22		0.33	
Chloromethane	ug/L	NA	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	
cis-1,2-Dichloroethene	ug/L	NA	0.22	U	0.22	0.22	U	0.22	0.22	J	0.22	0.27	J	0.22	
cis-1,3-Dichloropropene	ug/L	NA	0.22	U	0.22	0.22	U	0.22	0.22	U	0.22	0.22	U	0.22	
Cyclohexane	ug/L	NA	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	
Dibromochloromethane	ug/L	50	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	
Dichlorodifluoromethane	ug/L	NA	0.31	U	0.31	0.31	U	0.31	0.31	U	0.31	0.31	U	0.31	
Ethylbenzene	ug/L	5	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	
Freon TF	ug/L	NA	0.31	U	0.31	0.31	U	0.31	0.31	U	0.31	0.31	U	0.31	
Isopropylbenzene	ug/L	NA	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	0.34	U	0.34	
m&p-Xylene	ug/L	NA	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	

Table 2A
 Summary of Groundwater Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-8			MW-9			MW-10			DUP (MW-10)			
Lab Sample ID			460-203805-2			460-203805-3			460-203805-1			460-203805-4			
Sampling Date/Time			02/25/2020 10:15:00			02/25/2020 11:40:00			02/25/2020 09:05:00			02/25/2020 00:00:00			
Matrix			Groundwater			Groundwater			Groundwater			Groundwater			
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
Volatiles															
Methyl acetate	ug/L	NA	0.79	U	0.79	0.79	U	0.79	0.79	U	0.79	0.79	U	0.79	
Methylcyclohexane	ug/L	NA	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	
Methylene Chloride	ug/L	5	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	
MTBE	ug/L	NA	0.47	U	0.47	0.47	U	0.47	0.47	U	0.47	0.47	U	0.47	
o-Xylene	ug/L	NA	0.36	U	0.36	0.36	U	0.36	0.36	U	0.36	0.36	U	0.36	
Styrene	ug/L	NA	0.42	U	0.42	0.42	U	0.42	0.42	U	0.42	0.42	U	0.42	
Tetrachloroethene	ug/L	5	37		0.25	23		0.25	60		0.25	67		0.25	
Toluene	ug/L	5	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	
trans-1,2-Dichloroethene	ug/L	5	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	
trans-1,3-Dichloropropene	ug/L	NA	0.49	U	0.49	0.49	U	0.49	0.49	U	0.49	0.49	U	0.49	
Trichloroethene	ug/L	5	1		0.31	0.31	U	0.31	1.3		0.31	1.4		0.31	
Trichlorofluoromethane	ug/L	NA	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	
Vinyl chloride	ug/L	2	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	

Notes:
 AWQS - NYSDEC Ambient Water Quality Standards
 ug/L - micrograms per liter
 NA - Not Applicable/No Standard
 MDL - Minimum Detection Limit
 Q - Qualifier
Bold - Constituent detected above the MDL
Detected above the NYSDEC AWQS
 * - RPD of the LCS and LCSD exceeds the control Limits
 J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value
 U - Indicates the analyte was analyzed for but not detected

Table 2B
 Summary of Groundwater Sampling Results
 Semi-Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-1S			MW-1D			MW-2			MW-3			MW-4			MW-5			
Lab Sample ID			460-183847-3			460-183502-2			460-183502-1			460-183551-2			460-183875-1			460-183551-1			
Sampling Date/Time			06/05/2019 12:25:00			6/3/2019			6/3/2019			6/4/2019			6/6/2019			6/4/2019			
Matrix			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
SEMIVOLATILES																					
1,2,4,5-Tetrachlorobenzene	ug/L	NA	1.2	U	1.2	1.2	U*	1.2	1.2	U*	1.2	1.2	U*	1.2	1.2	U	1.2	1.2	U*	1.2	
2,2'-oxybis[1-chloropropane]	ug/L	5	0.63	U	0.63	0.63	U	0.63	0.63	U	0.63	0.63	U	0.63	0.63	U	0.63	0.63	U	0.63	
2,3,4,6-Tetrachlorophenol	ug/L	NA	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	
2,3,7,8- TCDD	ug/L	NA				1	U	1	1	U	1				1	U	1				
2,4,5-Trichlorophenol	ug/L	NA	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	
2,4,6-Trichlorophenol	ug/L	NA	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	
2,4-Dichlorophenol	ug/L	5	0.42	U	0.42	0.42	U	0.42	0.42	U	0.42	0.42	U	0.42	0.42	U	0.42	0.42	U	0.42	
2,4-Dimethylphenol	ug/L	NA	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	
2,4-Dinitrophenol	ug/L	NA	14	U	14	14	U	14	14	U	14	14	U	14	14	U	14	14	U	14	
2,4-Dinitrotoluene	ug/L	5	1	U	1	1	U	1	1	U	1	1	U	1	1	U	1	1	U	1	
2,6-Dinitrotoluene	ug/L	5	0.39	U	0.39	0.39	U	0.39	0.39	U	0.39	0.39	U	0.39	0.39	U	0.39	0.39	U	0.39	
2-Chloronaphthalene	ug/L	NA	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	
2-Chlorophenol	ug/L	NA	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	
2-Methylnaphthalene	ug/L	NA	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	
2-Methylphenol	ug/L	NA	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	
2-Nitroaniline	ug/L	5	0.47	U	0.47	0.47	U	0.47	0.47	U	0.47	0.47	U	0.47	0.47	U	0.47	0.47	U	0.47	
2-Nitrophenol	ug/L	NA	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	
3,3'-Dichlorobenzidine	ug/L	5	1.4	U	1.4	1.4	U	1.4	1.4	U	1.4	1.4	U	1.4	1.4	U	1.4	1.4	U	1.4	
3-Nitroaniline	ug/L	5	0.96	U	0.96	0.96	U	0.96	0.96	U	0.96	0.96	U	0.96	0.96	U	0.96	0.96	U	0.96	
4,6-Dinitro-2-methylphenol	ug/L	NA	13	U	13	0.38	U	0.38	0.38	U	0.38	13	U	13	13	U	13	13	U	13	
4-Bromophenyl phenyl ether	ug/L	NA	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	
4-Chloro-3-methylphenol	ug/L	NA	0.58	U	0.58	0.58	U	0.58	0.58	U	0.58	0.58	U	0.58	0.58	U	0.58	0.58	U	0.58	
4-Chloroaniline	ug/L	5	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	
4-Chlorophenyl phenyl ether	ug/L	NA	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	

Table 2B
 Summary of Groundwater Sampling Results
 Semi-Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-1S			MW-1D			MW-2			MW-3			MW-4			MW-5		
Lab Sample ID			460-183847-3			460-183502-2			460-183502-1			460-183551-2			460-183875-1			460-183551-1		
Sampling Date/Time			06/05/2019 12:25:00			6/3/2019			6/3/2019			6/4/2019			6/6/2019			6/4/2019		
Matrix			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater		
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
4-Methylphenol	ug/L	NA	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24
4-Nitroaniline	ug/L	5	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54
4-Nitrophenol	ug/L	NA	0.69	U	0.69	0.69	U	0.69	0.69	U	0.69	0.69	U	0.69	0.69	U	0.69	0.69	U	0.69
Acenaphthene	ug/L	NA	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1
Acenaphthylene	ug/L	NA	0.82	U	0.82	0.82	U	0.82	0.82	U	0.82	0.82	U	0.82	0.82	U	0.82	0.82	U	0.82
Acetophenone	ug/L	NA	0.79	U	0.79	0.79	U	0.79	0.79	U	0.79	0.79	U	0.79	0.79	U	0.79	0.79	U	0.79
Anthracene	ug/L	NA	0.63	U	0.63	0.63	U	0.63	0.63	U	0.63	0.63	U	0.63	0.63	U	0.63	0.63	U	0.63
Atrazine	ug/L	7.5	1.3	U	1.3	1.3	U*	1.3	1.3	U*	1.3	1.3	U*	1.3	1.3	U	1.3	1.3	U*	1.3
Benzaldehyde	ug/L	NA	0.59	U*	0.59	0.59	U	0.59	0.59	U	0.59	0.59	U	0.59	0.59	U*	0.59	0.59	U	0.59
Benzo[a]anthracene	ug/L	NA	0.016	U	0.016	0.016	U	0.016	0.016	U	0.016	0.59	U	0.59	0.59	U	0.59	0.59	U	0.59
Benzo[a]pyrene	ug/L	NA	0.022	U	0.022	0.022	U	0.022	0.022	U	0.022	0.41	U	0.41	0.41	U	0.41	0.41	U	0.41
Benzo[b]fluoranthene	ug/L	NA	0.024	U	0.024	0.024	U	0.024	0.024	U	0.024	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1
Benzo[g,h,i]perylene	ug/L	NA	1.4	U	1.4	1.4	U*	1.4	1.4	U*	1.4	1.4	U*	1.4	1.4	U	1.4	1.4	U*	1.4
Benzo[k]fluoranthene	ug/L	NA	0.67	U	0.67	0.028	U	0.028	0.028	U	0.028	0.67	U	0.67	0.67	U	0.67	0.67	U	0.67
Bis(2-chloroethoxy)methane	ug/L	5	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24
Bis(2-chloroethyl)ether	ug/L	1	0.026	U	0.026	0.026	U	0.026	0.026	U	0.026	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
Bis(2-ethylhexyl) phthalate	ug/L	5	1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	1.7	U	1.7
Butyl benzyl phthalate	ug/L	NA	0.85	U	0.85	0.85	U	0.85	0.85	U	0.85	0.85	U	0.85	0.85	U	0.85	0.85	U	0.85
Caprolactam	ug/L	NA	0.68	U	0.68	0.68	U*	0.68	0.68	U*	0.68	0.68	U*	0.68	0.68	U	0.68	0.68	U*	0.68
Carbazole	ug/L	NA	0.68	U	0.68	0.68	U	0.68	0.68	U	0.68	0.68	U	0.68	0.68	U	0.68	0.68	U	0.68
Chrysene	ug/L	NA	0.91	U	0.91	0.91	U	0.91	0.91	U	0.91	0.91	U	0.91	0.91	U	0.91	0.91	U	0.91

Table 2B
Summary of Groundwater Sampling Results
Semi-Volatile Organic Compounds
1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-1S			MW-1D			MW-2			MW-3			MW-4			MW-5		
Lab Sample ID			460-183847-3			460-183502-2			460-183502-1			460-183551-2			460-183875-1			460-183551-1		
Sampling Date/Time			06/05/2019 12:25:00			6/3/2019			6/3/2019			6/4/2019			6/6/2019			6/4/2019		
Matrix			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater		
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
Dibenz(a,h)anthracene	ug/L	NA	0.72	U	0.72	0.011	U	0.011	0.011	U	0.011	0.72	U	0.72	0.72	U	0.72	0.72	U	0.72
Dibenzofuran	ug/L	NA	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1
Diethyl phthalate	ug/L	NA	0.98	U	0.98	0.98	U	0.98	0.98	U	0.98	0.98	U	0.98	0.98	U	0.98	0.98	U	0.98
Dimethyl phthalate	ug/L	NA	0.77	U	0.77	0.77	U	0.77	0.77	U	0.77	0.77	U	0.77	0.77	U	0.77	0.77	U	0.77
Di-n-butyl phthalate	ug/L	50	0.84	U	0.84	0.84	U	0.84	0.84	U	0.84	0.84	U	0.84	0.84	U	0.84	0.84	U	0.84
Di-n-octyl phthalate	ug/L	NA	4.8	U	4.8	4.8	U	4.8	4.8	U	4.8	4.8	U	4.8	4.8	U	4.8	4.8	U	4.8
Diphenyl	ug/L	5	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2
Fluoranthene	ug/L	NA	0.84	U	0.84	0.84	U	0.84	0.84	U	0.84	0.84	U	0.84	0.84	U	0.84	0.84	U	0.84
Fluorene	ug/L	NA	0.91	U	0.91	0.91	U	0.91	0.91	U	0.91	0.91	U	0.91	0.91	U	0.91	0.91	U	0.91
Hexachlorobenzene	ug/L	0.04	0.013	U*	0.013	0.013	U	0.013	0.013	U	0.013	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4
Hexachlorobutadiene	ug/L	0.5	0.78	U	0.78	0.78	U	0.78	0.78	U	0.78	0.78	U	0.78	0.78	U	0.78	0.78	U	0.78
Hexachlorocyclopentadiene	ug/L	5	1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	1.7	U	1.7
Hexachloroethane	ug/L	5	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2
Indeno[1,2,3-cd]pyrene	ug/L	NA	1.3	U	1.3	0.036	U	0.036	0.036	U	0.036	1.3	U*	1.3	1.3	U	1.3	1.3	U*	1.3
Isophorone	ug/L	NA	0.8	U	0.8	0.8	U	0.8	0.8	U	0.8	0.8	U	0.8	0.8	U	0.8	0.8	U	0.8
Naphthalene	ug/L	NA	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1
Nitrobenzene	ug/L	0.4	0.57	U	0.57	0.57	U	0.57	0.57	U	0.57	0.57	U	0.57	0.57	U	0.57	0.57	U	0.57
N-Nitrosodi-n-propylamine	ug/L	NA	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43
N-Nitrosodiphenylamine	ug/L	NA	0.89	U	0.89	0.89	U	0.89	0.89	U	0.89	0.89	U	0.89	0.89	U	0.89	0.89	U	0.89
Pentachlorophenol	ug/L	NA	0.15	U	0.15	0.15	U	0.15	0.15	U	0.15	1.4	U	1.4	1.4	U	1.4	1.4	U	1.4
Phenanthrene	ug/L	NA	0.58	U	0.58	0.58	U	0.58	0.58	U	0.58	0.58	U	0.58	0.58	U	0.58	0.58	U	0.58
Phenol	ug/L	NA	0.29	U	0.29	0.29	U*	0.29	0.29	U*	0.29	0.29	U*	0.29	0.29	U	0.29	0.29	U*	0.29
Pyrene	ug/L	NA	1.6	U	1.6	1.6	U	1.6	1.6	U	1.6	1.6	U	1.6	1.6	U	1.6	1.6	U	1.6

Notes:

AWQS - NYSDEC Ambient Water Quality Standards

ug/L - micrograms per liter

NA - Not Applicable/No Standard

MDL - Minimum Detection Limit

Q - Qualifier

Bold - Constituent detected above the MDL

Detected above the NYSDEC AWQS

* - RPD of the LCS and LCSD exceeds the control Limits

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the analyte was analyzed for but not Detected

Table 2B
 Summary of Groundwater Sampling Results
 Semi-Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-6			MW-7			MW-11			FB			DUP			
Lab Sample ID			460-183502-3			460-183847-1			460-183847-2			460-183875-2			460-183847-5			
Sampling Date/Time			6/3/2019			6/5/2019			6/5/2019			06/06/2019 09:10:00			06/05/2019 00:00:00			
Matrix			Groundwater			Groundwater			Groundwater			Water			Water			
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
SEMIVOLATILES																		
1,2,4,5-Tetrachlorobenzene	ug/L	NA	1.2	U *	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2
2,2'-oxybis[1-chloropropane]	ug/L	5	0.63	U	0.63	0.63	U	0.63	0.63	U	0.63	0.63	U	0.63	0.63	U	0.63	0.63
2,3,4,6-Tetrachlorophenol	ug/L	NA	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75
2,3,7,8- TCDD	ug/L	NA	1	U	1							1	U	1				
2,4,5-Trichlorophenol	ug/L	NA	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	0.28
2,4,6-Trichlorophenol	ug/L	NA	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3
2,4-Dichlorophenol	ug/L	5	0.42	U	0.42	0.42	U	0.42	0.42	U	0.42	0.42	U	0.42	0.42	U	0.42	0.42
2,4-Dimethylphenol	ug/L	NA	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24
2,4-Dinitrophenol	ug/L	NA	14	U	14	14	U	14	14	U	14	14	U	14	14	U	14	14
2,4-Dinitrotoluene	ug/L	5	1	U	1	1	U	1	1	U	1	1	U	1	1	U	1	1
2,6-Dinitrotoluene	ug/L	5	0.39	U	0.39	0.39	U	0.39	0.39	U	0.39	0.39	U	0.39	0.39	U	0.39	0.39
2-Chloronaphthalene	ug/L	NA	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2
2-Chlorophenol	ug/L	NA	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38	U	0.38	0.38
2-Methylnaphthalene	ug/L	NA	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1
2-Methylphenol	ug/L	NA	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.26
2-Nitroaniline	ug/L	5	0.47	U	0.47	0.47	U	0.47	0.47	U	0.47	0.47	U	0.47	0.47	U	0.47	0.47
2-Nitrophenol	ug/L	NA	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75
3,3'-Dichlorobenzidine	ug/L	5	1.4	U	1.4	1.4	U	1.4	1.4	U	1.4	1.4	U	1.4	1.4	U	1.4	1.4
3-Nitroaniline	ug/L	5	0.96	U	0.96	0.96	U	0.96	0.96	U	0.96	0.96	U	0.96	0.96	U	0.96	0.96
4,6-Dinitro-2-methylphenol	ug/L	NA	0.38	U	0.38	13	U	13	13	U	13	13	U	13	13	U	13	13
4-Bromophenyl phenyl ether	ug/L	NA	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75	U	0.75	0.75
4-Chloro-3-methylphenol	ug/L	NA	0.58	U	0.58	0.58	U	0.58	0.58	U	0.58	0.58	U	0.58	0.58	U	0.58	0.58
4-Chloroaniline	ug/L	5	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.9
4-Chlorophenyl phenyl ether	ug/L	NA	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	1.3

Table 2B
 Summary of Groundwater Sampling Results
 Semi-Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-6			MW-7			MW-11			FB			DUP		
Lab Sample ID			460-183502-3			460-183847-1			460-183847-2			460-183875-2			460-183847-5		
Sampling Date/Time			6/3/2019			6/5/2019			6/5/2019			06/06/2019 09:10:00			06/05/2019 00:00:00		
Matrix			Groundwater			Groundwater			Groundwater			Water			Water		
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
4-Methylphenol	ug/L	NA	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24
4-Nitroaniline	ug/L	5	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54
4-Nitrophenol	ug/L	NA	0.69	U	0.69	0.69	U	0.69	0.69	U	0.69	0.69	U	0.69	0.69	U	0.69
Acenaphthene	ug/L	NA	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1
Acenaphthylene	ug/L	NA	0.82	U	0.82	0.82	U	0.82	0.82	U	0.82	0.82	U	0.82	0.82	U	0.82
Acetophenone	ug/L	NA	0.79	U	0.79	0.79	U	0.79	0.79	U	0.79	0.79	U	0.79	0.79	U	0.79
Anthracene	ug/L	NA	0.63	U	0.63	0.63	U	0.63	0.63	U	0.63	0.63	U	0.63	0.63	U	0.63
Atrazine	ug/L	7.5	1.3	U*	1.3	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3
Benzaldehyde	ug/L	NA	0.59	U	0.59	0.59	U*	0.59	0.59	U	0.59	0.59	U*	0.59	0.59	U*	0.59
Benzo[a]anthracene	ug/L	NA	0.016	U	0.016	0.016	U	0.016	0.016	U	0.016	0.59	U	0.59	0.016	U	0.016
Benzo[a]pyrene	ug/L	NA	0.022	U	0.022	0.022	U	0.022	0.022	U	0.022	0.41	U	0.41	0.022	U	0.022
Benzo[b]fluoranthene	ug/L	NA	0.024	U	0.024	0.024	U	0.024	0.024	U	0.024	1.1	U	1.1	0.024	U	0.024
Benzo[g,h,i]perylene	ug/L	NA	1.4	U*	1.4	1.4	U	1.4	1.4	U	1.4	1.4	U	1.4	1.4	U	1.4
Benzo[k]fluoranthene	ug/L	NA	0.028	U	0.028	0.67	U	0.67	0.67	U	0.67	0.67	U	0.67	0.67	U	0.67
Bis(2-chloroethoxy)methane	ug/L	5	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24
Bis(2-chloroethyl)ether	ug/L	1	0.026	U	0.026	0.026	U	0.026	0.026	U	0.026	0.3	U	0.3	0.026	U	0.026
Bis(2-ethylhexyl) phthalate	ug/L	5	1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	1.7	U	1.7
Butyl benzyl phthalate	ug/L	NA	0.85	U	0.85	0.85	U	0.85	0.85	U	0.85	0.85	U	0.85	0.85	U	0.85
Caprolactam	ug/L	NA	0.68	U*	0.68	0.68	U	0.68	0.68	U	0.68	0.68	U	0.68	0.68	U	0.68
Carbazole	ug/L	NA	0.68	U	0.68	0.68	U	0.68	0.68	U	0.68	0.68	U	0.68	0.68	U	0.68
Chrysene	ug/L	NA	0.91	U	0.91	0.91	U	0.91	0.91	U	0.91	0.91	U	0.91	0.91	U	0.91

Table 2B
 Summary of Groundwater Sampling Results
 Semi-Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-6			MW-7			MW-11			FB			DUP		
Lab Sample ID			460-183502-3			460-183847-1			460-183847-2			460-183875-2			460-183847-5		
Sampling Date/Time			6/3/2019			6/5/2019			6/5/2019			06/06/2019 09:10:00			06/05/2019 00:00:00		
Matrix			Groundwater			Groundwater			Groundwater			Water			Water		
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
Dibenz(a,h)anthracene	ug/L	NA	0.011	U	0.011	0.72	U	0.72	0.72	U	0.72	0.72	U	0.72	0.72	U	0.72
Dibenzofuran	ug/L	NA	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1
Diethyl phthalate	ug/L	NA	0.98	U	0.98	0.98	U	0.98	0.98	U	0.98	0.98	U	0.98	0.98	U	0.98
Dimethyl phthalate	ug/L	NA	0.77	U	0.77	0.77	U	0.77	0.77	U	0.77	0.77	U	0.77	0.77	U	0.77
Di-n-butyl phthalate	ug/L	50	0.84	U	0.84	0.84	U	0.84	0.84	U	0.84	0.84	U	0.84	0.84	U	0.84
Di-n-octyl phthalate	ug/L	NA	4.8	U	4.8	4.8	U	4.8	4.8	U	4.8	4.8	U	4.8	4.8	U	4.8
Diphenyl	ug/L	5	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2
Fluoranthene	ug/L	NA	0.84	U	0.84	0.84	U	0.84	0.84	U	0.84	0.84	U	0.84	0.84	U	0.84
Fluorene	ug/L	NA	0.91	U	0.91	0.91	U	0.91	0.91	U	0.91	0.91	U	0.91	0.91	U	0.91
Hexachlorobenzene	ug/L	0.04	0.013	U	0.013	0.013	U*	0.013	0.013	U	0.013	0.4	U	0.4	0.013	U*	0.013
Hexachlorobutadiene	ug/L	0.5	0.78	U	0.78	0.78	U	0.78	0.78	U	0.78	0.78	U	0.78	0.78	U	0.78
Hexachlorocyclopentadiene	ug/L	5	1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	1.7	U	1.7	1.7	U	1.7
Hexachloroethane	ug/L	5	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2	1.2	U	1.2
Indeno[1,2,3-cd]pyrene	ug/L	NA	0.036	U	0.036	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3	1.3	U	1.3
Isophorone	ug/L	NA	0.8	U	0.8	0.8	U	0.8	0.8	U	0.8	0.8	U	0.8	0.8	U	0.8
Naphthalene	ug/L	NA	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1
Nitrobenzene	ug/L	0.4	0.57	U	0.57	0.57	U	0.57	0.57	U	0.57	0.57	U	0.57	0.57	U	0.57
N-Nitrosodi-n-propylamine	ug/L	NA	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43
N-Nitrosodiphenylamine	ug/L	NA	0.89	U	0.89	0.89	U	0.89	0.89	U	0.89	0.89	U	0.89	0.89	U	0.89
Pentachlorophenol	ug/L	NA	0.15	U	0.15	0.15	U	0.15	0.15	U	0.15	1.4	U	1.4	0.15	U	0.15
Phenanthrene	ug/L	NA	0.58	U	0.58	0.58	U	0.58	0.58	U	0.58	0.58	U	0.58	0.58	U	0.58
Phenol	ug/L	NA	0.29	U*	0.29	0.29	U	0.29	0.29	U	0.29	0.29	U	0.29	0.29	U	0.29
Pyrene	ug/L	NA	1.6	U	1.6	1.6	U	1.6	1.6	U	1.6	1.6	U	1.6	1.6	U	1.6

Notes:

AWQS - NYSDEC Ambient Water Quality Standards

ug/L - micrograms per liter

NA - Not Applicable/No Standard

MDL - Minimum Detection Limit

Q - Qualifier

Bold - Constituent detected above the MDL

Detected above the NYSDEC AWQS

* - RPD of the LCS and LCSD exceeds the control Limits

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the analyte was analyzed for but not Detected

Table 2C
Summary of Groundwater Sampling Results
Metals
1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-1S			MW-1D			MW-2			MW-3			MW-4			MW-5		
Lab Sample ID			460-183847-3			460-183502-2			460-183502-1			460-183551-2			460-183875-1			460-183551-1		
Sampling Date/Time			06/05/2019 12:25:00			6/3/2019			6/3/2019			6/4/2019			6/6/2019			6/4/2019		
Matrix			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater		
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
TOTAL METALS																				
Aluminum	ug/L	NA	117		18.8	162		18.8	879		18.8	554		18.8	199		18.8	1750		18.8
Antimony	ug/L	3	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.74	J	0.4
Arsenic	ug/L	25	0.73	U	0.73	0.73	U	0.73	0.73	U	0.73	0.73	U	0.73	0.73	U	0.73	0.76	J	0.73
Barium	ug/L	1000	100		1.2	84.1		1.2	68.8		1.2	54.7		1.2	92.5		1.2	66		1.2
Beryllium	ug/L	NA	0.25	U	0.25	0.25	U	0.25	0.25	U	0.25	0.25	U	0.25	0.25	U	0.25	0.25	U	0.25
Cadmium	ug/L	5	0.81	U	0.81	0.81	U	0.81	0.81	U	0.81	0.81	U	0.81	0.81	U	0.81	0.81	U	0.81
Calcium	ug/L	NA	101000		98.8	114000		98.8	46900		98.8	84900		98.8	66300		98.8	66200		98.8
Chromium	ug/L	50	18.5		2.3	2.4	J	2.3	8.8		2.3	3.4	J	2.3	2.3	U	2.3	7.9		2.3
Cobalt	ug/L	NA	1.6	U	1.6	1.6	U	1.6	3.1	J	1.6	3.9	J	1.6	1.6	U	1.6	2.4	J	1.6
Copper	ug/L	200	2	U	2	2	U	2	6.3		2	3.3	J	2	2	U	2	10.2		2
Cyanide	ug/L	0.2	0.004	U	0.004	0.0047	JB	0.004	0.0056	JB	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004
Iron	ug/L	300	408		51.1	392		51.1	2640		51.1	1380		51.1	528		51.1	3510		51.1
Lead	ug/L	25	0.63	J	0.55	3.5		0.55	1	J	0.55	1.1	J	0.55	0.69	J	0.55	20.1		0.55
Magnesium	ug/L	NA	18100		73.7	46500		73.7	7060		73.7	20800		73.7	12100		73.7	10600		73.7
Manganese	ug/L	300	13.1		2.9	528		2.9	921		2.9	1340		2.9	40.5		2.9	915		2.9
Mercury	ug/L	0.7	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12
Nickel	ug/L	100	4.3		2.4	4.6		2.4	7.4		2.4	8.5		2.4	2.4	U	2.4	6.3		2.4
Potassium	ug/L	NA	3130		86.7	3080		86.7	3860		86.7	4160		86.7	2500		86.7	3560		86.7
Selenium	ug/L	10	5.4	U	5.4	5.4	U	5.4	5.4	U	5.4	5.4	U	5.4	5.4	U	5.4	5.4	U	5.4

Table 2C
 Summary of Groundwater Sampling Results
 Metals
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-1S			MW-1D			MW-2			MW-3			MW-4			MW-5		
Lab Sample ID			460-183847-3			460-183502-2			460-183502-1			460-183551-2			460-183875-1			460-183551-1		
Sampling Date/Time			06/05/2019 12:25:00			6/3/2019			6/3/2019			6/4/2019			6/6/2019			6/4/2019		
Matrix			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater		
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
Silver	ug/L	50	0.59	U	0.59	0.59	U	0.59	0.59	U	0.59	0.59	U	0.59	0.59	U	0.59	0.59	U	0.59
Sodium	ug/L	20000	131000		128	74100		128	185000		128	62800		128	137000		128	22400		128
Thallium	ug/L	NA	0.16	U	0.16	0.16	U	0.16	0.16	U	0.16	0.16	U	0.16	0.16	U	0.16	0.16	U	0.16
Vanadium	ug/L	NA	1.1	U	1.1	1.1	U	1.1	2.6	J	1.1	1.3	J	1.1	1.1	U	1.1	4.3		1.1
Zinc	ug/L	NA	11.1	U	11.1	11.1	U	11.1	11.1	U	11.1	11.1	U	11.1	11.1	U	11.1	39.4		11.1

Notes:

AWQS - NYSDEC Ambient Water
 Quality Standards

ug/L - micrograms per liter

NA - Not Applicable/No Standard

MDL - Minimum Detection Limit

Q - Qualifier

**Bold - Constituent detected above the
 MDL**

Detected above the NYSDEC AWQS

J - Result is less than the RL but
 greater than or equal to the MDL
 and the concentration is an
 approximate value

U - Indicates the analyte was analyzed
 for but Not Detected

B - Compound was found in blank sample

Table 2C
 Summary of Groundwater Sampling Results
 Metals
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-6			MW-7			MW-11			FB			DUP		
Lab Sample ID			460-183502-3			460-183847-1			460-183847-2			460-183875-2			460-183847-5		
Sampling Date/Time			6/3/2019			6/5/2019			6/5/2019			06/06/2019 09:10:00			06/05/2019 00:00:00		
Matrix			Groundwater			Groundwater			Groundwater			Water			Water		
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
TOTAL METALS																	
Aluminum	ug/L	NA	461		18.8	530		18.8	49.3		18.8	18.8	U	18.8	68.5		18.8
Antimony	ug/L	3	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4
Arsenic	ug/L	25	0.73	U	0.73	0.73	U	0.73	0.73	U	0.73	0.73	U	0.73	0.73	U	0.73
Barium	ug/L	1000	40.3		1.2	75.4		1.2	26.9		1.2	1.2	U	1.2	98.7		1.2
Beryllium	ug/L	NA	0.25	U	0.25	0.25	U	0.25	0.25	U	0.25	0.25	U	0.25	0.25	U	0.25
Cadmium	ug/L	5	0.81	U	0.81	0.81	U	0.81	0.81	U	0.81	0.81	U	0.81	0.81	U	0.81
Calcium	ug/L	NA	34700		98.8	48300		98.8	69100		98.8	98.8	U	98.8	96600		98.8
Chromium	ug/L	50	2.8	J	2.3	3.4	J	2.3	2.3	U	2.3	2.3	U	2.3	10.5		2.3
Cobalt	ug/L	NA	4.4		1.6	1.6	U	1.6	1.6	U	1.6	1.6	U	1.6	1.6	U	1.6
Copper	ug/L	200	2	U	2	3.6	J	2	2	U	2	2	U	2	2	U	2
Cyanide	ug/L	0.2	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004
Iron	ug/L	300	1660		51.1	1260		51.1	87	J	51.1	51.1	U	51.1	240		51.1
Lead	ug/L	25	0.65	J	0.55	1.3		0.55	0.6	J	0.55	0.55	U	0.55	0.55	U	0.55
Magnesium	ug/L	NA	13600		73.7	6310		73.7	6390		73.7	73.7	U	73.7	18100		73.7
Manganese	ug/L	300	1160		2.9	322		2.9	7.1	J	2.9	2.9	U	2.9	7.7	J	2.9
Mercury	ug/L	0.7	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12
Nickel	ug/L	100	9		2.4	4.1		2.4	2.4	U	2.4	2.4	U	2.4	4		2.4
Potassium	ug/L	NA	2240		86.7	7810		86.7	1640		86.7	86.7	U	86.7	3100		86.7
Selenium	ug/L	10	5.4	U	5.4	5.4	U	5.4	5.4	U	5.4	5.4	U	5.4	5.4	U	5.4

Table 2C
 Summary of Groundwater Sampling Results
 Metals
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-6			MW-7			MW-11			FB			DUP		
Lab Sample ID			460-183502-3			460-183847-1			460-183847-2			460-183875-2			460-183847-5		
Sampling Date/Time			6/3/2019			6/5/2019			6/5/2019			06/06/2019 09:10:00			06/05/2019 00:00:00		
Matrix			Groundwater			Groundwater			Groundwater			Water			Water		
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
Silver	ug/L	50	0.59	U	0.59	0.59	U	0.59	0.59	U	0.59	0.59	U	0.59	0.59	U	0.59
Sodium	ug/L	20000	45300		128	169000		128	12100		128	128	U	128	134000		128
Thallium	ug/L	NA	0.16	U	0.16	0.16	U	0.16	0.16	U	0.16	0.16	U	0.16	0.16	U	0.16
Vanadium	ug/L	NA	1.5	J	1.1	1.5	J	1.1	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1
Zinc	ug/L	NA	11.1	U	11.1	11.1	U	11.1	11.1	U	11.1	11.1	U	11.1	11.1	U	11.1

Notes:

AWQS - NYSDEC Ambient Water
 Quality Standards

ug/L - micrograms per liter

NA - Not Applicable/No Standard

MDL - Minimum Detection Limit

Q - Qualifier

**Bold - Constituent detected above the
 MDL**

Detected above the NYSDEC AWQS

J - Result is less than the RL but
 greater than or equal to the MDL
 and the concentration is an
 approximate value

U - Indicates the analyte was analyzed
 for but Not Detected

B - Compound was found in blank sample

Table 2D
 Summary of Groundwater Sampling Results
 Pesticides
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-1S			MW-1D			MW-2			MW-3			MW-4			MW-5			
Lab Sample ID			460-183847-3			460-183502-2			460-183502-1			460-183551-2			460-183875-1			460-183551-1			
Sampling Date/Time			06/05/2019 12:25:00			6/3/2019			6/3/2019			6/4/2019			6/6/2019			6/4/2019			
Matrix			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
PESTICIDES																					
4,4'-DDD	ug/L	0.3	0.006	U	0.006	0.006	U	0.006	0.006	U	0.006	0.006	U	0.006	0.006	U	0.006	0.006	U	0.006	
4,4'-DDE	ug/L	0.2	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	
4,4'-DDT	ug/L	0.2	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	
Aldrin	ug/L	NA	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	
alpha-BHC	ug/L	0.01	0.007	U	0.007	0.007	U	0.007	0.007	U	0.007	0.007	U	0.007	0.007	U	0.007	0.007	U	0.007	
beta-BHC	ug/L	0.04	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	
Chlordane (n.o.s.)	ug/L	NA	0.055	U	0.055	0.055	U	0.055	0.055	U	0.055	0.055	U	0.055	0.055	U	0.055	0.055	U	0.055	
Chlordane (technical)	ug/L	0.05	0.055	U	0.055	0.002	U	0.002	0.002	U	0.002	0.055	U	0.055	0.002	U	0.002	0.055	U	0.055	
delta-BHC	ug/L	0.04	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005	
Dieldrin	ug/L	0.004	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	
Endosulfan I	ug/L	NA	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	
Endosulfan II	ug/L	NA	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	
Endosulfan sulfate	ug/L	NA	0.006	U	0.006	0.006	U	0.006	0.006	U	0.006	0.006	U	0.006	0.006	U	0.006	0.006	U	0.006	
Endosulfan, Total	ug/L	NA	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	
Endrin	ug/L	NA	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	
Endrin aldehyde	ug/L	5	0.008	U	0.008	0.008	U	0.008	0.008	U	0.008	0.008	U	0.008	0.008	U	0.008	0.008	U	0.008	
Endrin ketone	ug/L	5	0.008	U	0.008	0.008	U	0.008	0.008	U	0.008	0.008	U	0.008	0.008	U	0.008	0.008	U	0.008	
gamma-BHC (Lindane)	ug/L	0.05	0.012	U	0.012	0.012	U	0.012	0.012	U	0.012	0.012	U	0.012	0.012	U	0.012	0.012	U	0.012	
Heptachlor	ug/L	0.04	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	
Heptachlor epoxide	ug/L	0.03	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005	
Methoxychlor	ug/L	35	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	
Toxaphene	ug/L	0.06	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	
trans-Chlordane	ug/L	NA				0.003	U	0.003	0.003	U	0.003				0.003	U	0.003				

Notes:

AWQS - NYSDEC Ambient Water Quality Standards

ug/L - micrograms per liter

NA - Not Applicable/No Standard

MDL - Minimum Detection Limit

Q - Qualifier

U - Indicates the analyte was analyzed for but not detected

Table 2D
 Summary of Groundwater Sampling Results
 Pesticides
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-6			MW-7			MW-11			FB			DUP		
Lab Sample ID			460-183502-3			460-183847-1			460-183847-2			460-183875-2			460-183847-5		
Sampling Date/Time			6/3/2019			6/5/2019			6/5/2019			06/06/2019 09:10:00			06/05/2019 00:00:00		
Matrix			Groundwater			Groundwater			Groundwater			Water			Water		
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL
PESTICIDES																	
4,4'-DDD	ug/L	0.3	0.006	U	0.006	0.006	U	0.006	0.006	U	0.006	0.006	U	0.006	0.006	U	0.006
4,4'-DDE	ug/L	0.2	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002
4,4'-DDT	ug/L	0.2	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004
Aldrin	ug/L	NA	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003
alpha-BHC	ug/L	0.01	0.007	U	0.007	0.007	U	0.007	0.007	U	0.007	0.007	U	0.007	0.007	U	0.007
beta-BHC	ug/L	0.04	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004
Chlordane (n.o.s.)	ug/L	NA	0.055	U	0.055	0.055	U	0.055	0.055	U	0.055	0.055	U	0.055	0.055	U	0.055
Chlordane (technical)	ug/L	0.05	0.002	U	0.002	0.055	U	0.055	0.055	U	0.055	0.002	U	0.002	0.055	U	0.055
delta-BHC	ug/L	0.04	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005
Dieldrin	ug/L	0.004	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003
Endosulfan I	ug/L	NA	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002
Endosulfan II	ug/L	NA	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004
Endosulfan sulfate	ug/L	NA	0.006	U	0.006	0.006	U	0.006	0.006	U	0.006	0.006	U	0.006	0.006	U	0.006
Endosulfan, Total	ug/L	NA	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.002	U	0.002
Endrin	ug/L	NA	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004
Endrin aldehyde	ug/L	5	0.008	U	0.008	0.008	U	0.008	0.008	U	0.008	0.008	U	0.008	0.008	U	0.008
Endrin ketone	ug/L	5	0.008	U	0.008	0.008	U	0.008	0.008	U	0.008	0.008	U	0.008	0.008	U	0.008
gamma-BHC (Lindane)	ug/L	0.05	0.012	U	0.012	0.012	U	0.012	0.012	U	0.012	0.012	U	0.012	0.012	U	0.012
Heptachlor	ug/L	0.04	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003	0.003	U	0.003
Heptachlor epoxide	ug/L	0.03	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005
Methoxychlor	ug/L	35	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.004	U	0.004
Toxaphene	ug/L	0.06	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11
trans-Chlordane	ug/L	NA	0.003	U	0.003							0.003	U	0.003			

Notes:

- AWQS - NYSDEC Ambient Water Quality Standards
- ug/L - micrograms per liter
- NA - Not Applicable/No Standard
- MDL - Minimum Detection Limit
- Q - Qualifier
- U - Indicates the analyte was analyzed for but not detected

Table 2E
 Summary of Groundwater Sampling Results
 Total PCBs
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-1S			MW-1D			MW-2			MW-3			MW-4			MW-5			
Lab Sample ID			460-183847-3			460-183502-2			460-183502-1			460-183551-2			460-183875-1			460-183551-1			
Sampling Date/Time			06/05/2019 12:25:00			6/3/2019			6/3/2019			6/4/2019			6/6/2019			6/4/2019			
Matrix			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
PCBs																					
Aroclor 1016	ug/L	0.09	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	
Aroclor 1221	ug/L	0.09	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	
Aroclor 1232	ug/L	0.09	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	
Aroclor 1242	ug/L	0.09	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	
Aroclor 1248	ug/L	0.09	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	
Aroclor 1254	ug/L	0.09	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	
Aroclor 1260	ug/L	0.09	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	
Aroclor 1268	ug/L	0.09	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	
Aroclor-1262	ug/L	0.09	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	
Total PCBs	ug/L	0.09	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	

Notes:
 AWQS - NYSDEC Ambient Water
 Quality Standards

 ug/L - micrograms per liter
 NA - Not Applicable/No Standard
 MDL - Minimum Detection Limit
 Q - Qualifier
 U - Indicates the analyte was analyzed
 for but not detected

Table 2E
 Summary of Groundwater Sampling Results
 Total PCBs
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-6			MW-7			MW-11			FB			DUP			
Lab Sample ID			460-183502-3			460-183847-1			460-183847-2			460-183875-2			460-183847-5			
Sampling Date/Time			6/3/2019			6/5/2019			6/5/2019			06/06/2019 09:10:00			06/05/2019 00:00:00			
Matrix			Groundwater			Groundwater			Groundwater			Water			Water			
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
PCBs																		
Aroclor 1016	ug/L	0.09	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	
Aroclor 1221	ug/L	0.09	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	
Aroclor 1232	ug/L	0.09	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	
Aroclor 1242	ug/L	0.09	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	
Aroclor 1248	ug/L	0.09	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	
Aroclor 1254	ug/L	0.09	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	
Aroclor 1260	ug/L	0.09	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	
Aroclor 1268	ug/L	0.09	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	
Aroclor-1262	ug/L	0.09	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	0.11	U	0.11	
Total PCBs	ug/L	0.09	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	0.12	U	0.12	

Notes:
 AWQS - NYSDEC Ambient Water
 Quality Standards

 ug/L - micrograms per liter
 NA - Not Applicable/No Standard
 MDL - Minimum Detection Limit
 Q - Qualifier
 U - Indicates the analyte was analyzed
 for but not detected

Table 2F
 Summary of Groundwater Sampling Results
 PFAS
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-1S			MW-1D			MW-2			MW-3			MW-4			MW-5			
Lab Sample ID			460-183847-3			460-183502-2			460-183502-1			460-183551-2			460-183875-1			460-183551-1			
Sampling Date/Time			06/05/2019 12:25:00			6/3/2019			6/3/2019			6/4/2019			6/6/2019			6/4/2019			
Matrix			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
FLUORINATED ALKYL SUBSTANCES																					
6:2 FTS	ng/L	NA	NA	NA	NA	8.76	J	1.8	71.6		1.92	NA	NA	NA	NA	NA	NA	13	J	1.88	
8:2 FTS	ng/L	NA	NA	NA	NA	1.8	U	1.8	1.92	U	1.92	NA	NA	NA	NA	NA	NA	1.88	U	1.88	
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ng/L	NA	NA	NA	NA	1.71	U	1.71	1.82	U	1.82	NA	NA	NA	NA	NA	NA	1.79	U	1.79	
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ng/L	NA	NA	NA	NA	2.78	U	2.78	2.98	U	2.98	NA	NA	NA	NA	NA	NA	2.92	U	2.92	
Perfluorobutanesulfonic acid (PFBS)	ng/L	NA	NA	NA	NA	5.91		0.18	5.77		0.19	NA	NA	NA	NA	NA	NA	0.5	J	0.19	
Perfluorobutanoic acid (PFBA)	ng/L	NA	NA	NA	NA	6.56		0.31	9.51		0.34	NA	NA	NA	NA	NA	NA	5.94		0.33	
Perfluorodecanesulfonic acid (PFDS)	ng/L	NA	NA	NA	NA	0.29	U	0.29	0.31	U	0.31	NA	NA	NA	NA	NA	NA	0.3	U	0.3	
Perfluorodecanoic acid (PFDA)	ng/L	NA	NA	NA	NA	0.28	U	0.28	0.42	J	0.3	NA	NA	NA	NA	NA	NA	0.29	J	0.29	
Perfluorododecanoic acid (PFDoA)	ng/L	NA	NA	NA	NA	0.49	U	0.49	0.53	U	0.53	NA	NA	NA	NA	NA	NA	0.52	U	0.52	
Perfluoroheptanesulfonic Acid (PFHpS)	ng/L	NA	NA	NA	NA	0.36	J	0.17	1.14	J	0.18	NA	NA	NA	NA	NA	NA	0.29	J	0.18	
Perfluoroheptanoic acid (PFHpA)	ng/L	NA	NA	NA	NA	11.4		0.22	14		0.24	NA	NA	NA	NA	NA	NA	25.4		0.24	
Perfluorohexanesulfonic acid (PFHxS)	ng/L	NA	NA	NA	NA	10	B	0.15	8.81	B	0.16	NA	NA	NA	NA	NA	NA	0.92	J B	0.16	
Perfluorohexanoic acid (PFHxA)	ng/L	NA	NA	NA	NA	12.6		0.52	19		0.56	NA	NA	NA	NA	NA	NA	17.7		0.55	
Perfluorononanoic acid (PFNA)	ng/L	NA	NA	NA	NA	0.37	J	0.24	2.09		0.26	NA	NA	NA	NA	NA	NA	4.18		0.25	
Perfluorooctanesulfonamide (FOSA)	ng/L	NA	NA	NA	NA	0.31	U	0.31	0.34	U	0.34	NA	NA	NA	NA	NA	NA	0.33	U	0.33	
Perfluorooctanesulfonic acid (PFOS)	ng/L	NA	NA	NA	NA	13.3		0.49	75.5		0.52	NA	NA	NA	NA	NA	NA	14.5		0.51	
Perfluorooctanoic acid (PFOA)	ng/L	NA	NA	NA	NA	48.4		0.76	86.5		0.82	NA	NA	NA	NA	NA	NA	62.2		0.8	
Perfluoropentanoic acid (PFPeA)	ng/L	NA	NA	NA	NA	14.5		0.44	19		0.47	NA	NA	NA	NA	NA	NA	21.4		0.46	
Perfluorotetradecanoic acid (PFTeA)	ng/L	NA	NA	NA	NA	0.26	U	0.26	0.28	U	0.28	NA	NA	NA	NA	NA	NA	0.27	U	0.27	
Perfluorotridecanoic acid (PFTriA)	ng/L	NA	NA	NA	NA	1.17	U	1.17	1.25	U	1.25	NA	NA	NA	NA	NA	NA	1.22	U	1.22	
Perfluoroundecanoic acid (PFUnA)	ng/L	NA	NA	NA	NA	0.99	U	0.99	1.06	U	1.06	NA	NA	NA	NA	NA	NA	1.04	U	1.04	
Total PFAS (Excluding PFOS & PFOA)	ng/L	NA	NA	NA	NA	70.46			151.34			NA	NA	NA	NA	NA	NA	89.62			
Total PFAS	ng/L	NA	NA	NA	NA	132.16			313.34			NA	NA	NA	NA	NA	NA	166.32			

Notes:

ng/L - nanograms per liter

NA - Not Analyzed

MDL - Minimum Detection Limit

Q - Qualifier

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the analyte was analyzed for but Not Detected

B - Compound was found in blank sample

Table 2F
 Summary of Groundwater Sampling Results
 PFAS
 1510 Broadway, Brooklyn, NY

Sample ID	Units	NYSDEC AWQS	MW-6			MW-7			MW-11			FB			DUP			
Lab Sample ID			460-183502-3			460-183847-1			460-183847-2			460-183875-2			460-183847-5			
Sampling Date/Time			6/3/2019			6/5/2019			6/5/2019			06/06/2019 09:10:00			06/05/2019 00:00:00			
Matrix			Groundwater			Groundwater			Groundwater			Water			Water			
			Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	Result	Q	MDL	
FLUORINATED ALKYL SUBSTANCES																		
6:2 FTS	ng/L	NA	1.76	U	1.76	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8:2 FTS	ng/L	NA	1.76	U	1.76	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ng/L	NA	1.67	U	1.67	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ng/L	NA	2.73	U	2.73	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorobutanesulfonic acid (PFBS)	ng/L	NA	5.19		0.18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorobutanoic acid (PFBA)	ng/L	NA	8.93		0.31	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorodecanesulfonic acid (PFDS)	ng/L	NA	0.28	U	0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorodecanoic acid (PFDA)	ng/L	NA	0.27	U	0.27	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorododecanoic acid (PFDoA)	ng/L	NA	0.48	U	0.48	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroheptanesulfonic Acid (PFHpS)	ng/L	NA	0.64	J	0.17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroheptanoic acid (PFHpA)	ng/L	NA	21.1		0.22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexanesulfonic acid (PFHxS)	ng/L	NA	11.7	B	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorohexanoic acid (PFHxA)	ng/L	NA	20		0.51	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorononanoic acid (PFNA)	ng/L	NA	0.95	J	0.24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctanesulfonamide (FOSA)	ng/L	NA	0.31	U	0.31	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctanesulfonic acid (PFOS)	ng/L	NA	22.8		0.48	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorooctanoic acid (PFOA)	ng/L	NA	102		0.75	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoropentanoic acid (PFPeA)	ng/L	NA	17.7		0.43	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotetradecanoic acid (PFTeA)	ng/L	NA	0.26	U	0.26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluorotridecanoic acid (PFTriA)	ng/L	NA	1.15	U	1.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perfluoroundecanoic acid (PFUnA)	ng/L	NA	0.97	U	0.97	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PFAS (Excluding PFOS & PFOA)	ng/L	NA	86.21			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PFAS	ng/L	NA	211.01			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

ng/L - nanograms per liter

NA - Not Analyzed

MDL - Minimum Detection Limit

Q - Qualifier

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value

U - Indicates the analyte was analyzed for but Not Detected

B - Compound was found in blank sample

Table 3
Summary of Soil Vapor Sampling Results
Volatile Organic Compounds
1510 Broadway, Brooklyn, NY

Sample ID	Units	SV-13			SV-14			SV-16			SV-17			SV-18		
Lab Sample ID		200-48908-2			200-48908-3			200-48908-5			200-48908-6			200-48908-8		
Sampling Date/Time		05/21/2019 09:30:00			05/21/2019 09:50:00			05/21/2019 10:35:00			05/21/2019 10:45:00			05/21/2019 11:05:00		
		Conc	Q	MDL	Conc	Q	MDL	Conc	Q	MDL	Conc	Q	MDL	Conc	Q	MDL
AIR_UGM3 BY TO-15																
1,1,1-Trichloroethane	ug/m3	11	U	11	11	U	11	11	U	11	11	U	11	11	U	11
1,1,2,2-Tetrachloroethane	ug/m3	14	U	14	14	U	14	14	U	14	14	U	14	14	U	14
1,1,2-Trichloroethane	ug/m3	11	U	11	11	U	11	11	U	11	11	U	11	11	U	11
1,1-Dichloroethane	ug/m3	8	U	8	8	U	8	8	U	8	8	U	8	8	U	8
1,1-Dichloroethene	ug/m3	8	U	8	8	U	8	8	U	8	8	U	8	8	U	8
1,2,4-Trichlorobenzene	ug/m3	37	U	37	37	U	37	37	U	37	37	U	37	37	U	37
1,2,4-Trimethylbenzene	ug/m3	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
1,2-Dibromoethane	ug/m3	15	U	15	15	U	15	15	U	15	15	U	15	15	U	15
1,2-Dichlorobenzene	ug/m3	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
1,2-Dichloroethane	ug/m3	8	U	8	8	U	8	8	U	8	8	U	8	8	U	8
1,2-Dichloropropane	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	9	U	9
1,2-Dichlorotetrafluoroethane	ug/m3	14	U	14	14	U	14	14	U	14	14	U	14	14	U	14
1,3,5-Trimethylbenzene	ug/m3	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
1,3-Butadiene	ug/m3	8		4	6		4	6		4	8		4	120		4
1,3-Dichlorobenzene	ug/m3	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
1,4-Dichlorobenzene	ug/m3	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
1,4-Dioxane	ug/m3	180	U	180	180	U	180	180	U	180	180	U	180	180	U	180
2,2,4-Trimethylpentane	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	9	U	9
2-Chlorotoluene	ug/m3	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
3-Chloropropene	ug/m3	16	U	16	16	U	16	16	U	16	16	U	16	16	U	16
4-Ethyltoluene	ug/m3	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
Acetone	ug/m3	1300	D	360	490		120	1100	D	360	700		120	850		120
Benzene	ug/m3	6	U	6	6	U	6	6	U	6	6	U	6	6	U	6
Bromodichloromethane	ug/m3	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13
Bromoethene(Vinyl Bromide)	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	9	U	9
Bromoform	ug/m3	21	U	21	21	U	21	21	U	21	21	U	21	21	U	21
Bromomethane	ug/m3	8	U	8	8	U	8	8	U	8	8	U	8	8	U	8
Carbon disulfide	ug/m3	16	U	16	16	U	16	16	U	16	16	U	16	16	U	16
Carbon tetrachloride	ug/m3	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13
Chlorobenzene	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	9	U	9
Chloroethane	ug/m3	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13

Table 3
 Summary of Soil Vapor Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	SV-13			SV-14			SV-16			SV-17			SV-18		
Lab Sample ID		200-48908-2			200-48908-3			200-48908-5			200-48908-6			200-48908-8		
Sampling Date/Time		05/21/2019 09:30:00			05/21/2019 09:50:00			05/21/2019 10:35:00			05/21/2019 10:45:00			05/21/2019 11:05:00		
Chloroform	ug/m3	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
Chloromethane	ug/m3	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
cis-1,2-Dichloroethene	ug/m3	8	U	8	8	U	8	8	U	8	8	U	8	8	U	8
cis-1,3-Dichloropropene	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	9	U	9
Cyclohexane	ug/m3	7	U	7	7	U	7	7	U	7	7	U	7	11		7
Dibromochloromethane	ug/m3	17	U	17	17	U	17	17	U	17	17	U	17	17	U	17
Dichlorodifluoromethane	ug/m3	25	U	25	25	U	25	25	U	25	25	U	25	25	U	25
Ethanol	ug/m3	94	U	94	94	U	94	94	U	94	94	U	94	94	U	94
Ethylbenzene	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	9	U	9
Freon TF	ug/m3	15	U	15	15	U	15	15	U	15	15	U	15	15	U	15
Hexachlorobutadiene	ug/m3	21	U	21	21	U	21	21	U	21	21	U	21	21	U	21
Isopropyl alcohol	ug/m3	120	U	120	120	U	120	120	U	120	120	U	120	120	U	120
m,p-Xylene	ug/m3	22	U	22	22	U	22	22	U	22	22	U	22	22	U	22
Methyl Ethyl Ketone	ug/m3	110		15	47		15	54		15	15	U	15	32		15
methyl isobutyl ketone	ug/m3	20	U	20	20	U	20	20	U	20	20	U	20	20	U	20

Table 3
 Summary of Soil Vapor Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	SV-13			SV-14			SV-16			SV-17			SV-18		
Lab Sample ID		200-48908-2			200-48908-3			200-48908-5			200-48908-6			200-48908-8		
Sampling Date/Time		05/21/2019 09:30:00			05/21/2019 09:50:00			05/21/2019 10:35:00			05/21/2019 10:45:00			05/21/2019 11:05:00		
Methyl methacrylate	ug/m3	20	U	20	20	U	20	20	U	20	20	U	20	20	U	20
Methyl tert-butyl ether	ug/m3	7	U	7	7	U	7	7	U	7	7	U	7	7	U	7
Methylene Chloride	ug/m3	17	U	17	17	U	17	17	U	17	17	U	17	17	U	17
n-Heptane	ug/m3	10		8	8	U	8	8	U	8	10		8	11		8
n-Hexane	ug/m3	9		7	7	U	7	40		7	19		7	38		7
Styrene	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	9	U	9
tert-Butyl alcohol	ug/m3	150	U	150	150	U	150	150	U	150	150	U	150	150	U	150
Tetrachloroethene	ug/m3	34		14	14	U	14	20		14	14	U	14	14	U	14
Tetrahydrofuran	ug/m3	150	U	150	150	U	150	150	U	150	150	U	150	150	U	150
Toluene	ug/m3	8	U	8	8	U	8	8	U	8	8		8	8	U	8
trans-1,2-Dichloroethene	ug/m3	8	U	8	8	U	8	8	U	8	8	U	8	8	U	8
trans-1,3-Dichloropropene	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	9	U	9
Trichloroethene	ug/m3	11	U	11	11	U	11	11	U	11	11	U	11	11	U	11
Trichlorofluoromethane	ug/m3	11	U	11	11	U	11	13		11	11	U	11	11	U	11
Vinyl chloride	ug/m3	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5
Xylene, o-	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	9	U	9

Notes:

Q = Qualifier

ug/m3 = Micrograms per meter cubed

U =Indicates the analyte was analyzed
for but not detected

D = Indicates sample dilution was
required for analysis

Conc - Concentration

MDL - Minimum Detection Limit

Table 3
Summary of Soil Vapor Sampling Results
Volatile Organic Compounds
1510 Broadway, Brooklyn, NY

Sample ID	Units	SV-19			SV-20			SV-21			SV-22			SV-23		
Lab Sample ID		200-48908-12			200-48908-10			200-48908-11			200-48908-13			200-48908-1		
Sampling Date/Time		05/21/2019 12:25:00			05/21/2019 11:45:00			05/21/2019 12:10:00			05/21/2019 12:45:00			05/21/2019 09:20:00		
		Conc	Q	MDL	Conc	Q	MDL	Conc	Q	MDL	Conc	Q	MDL	Conc	Q	MDL
AIR_UGM3 BY TO-15																
1,1,1-Trichloroethane	ug/m3	11	U	11	11	U	11	11	U	11	11	U	11	22	U	22
1,1,2,2-Tetrachloroethane	ug/m3	14	U	14	14	U	14	14	U	14	14	U	14	27	U	27
1,1,2-Trichloroethane	ug/m3	11	U	11	11	U	11	11	U	11	11	U	11	22	U	22
1,1-Dichloroethane	ug/m3	8	U	8	8	U	8	8	U	8	8	U	8	16	U	16
1,1-Dichloroethene	ug/m3	8	U	8	8	U	8	8	U	8	8	U	8	16	U	16
1,2,4-Trichlorobenzene	ug/m3	37	U	37	37	U	37	37	U	37	37	U	37	74	U	74
1,2,4-Trimethylbenzene	ug/m3	10	U	10	10	U	10	10	U	10	10	U	10	20	U	20
1,2-Dibromoethane	ug/m3	15	U	15	15	U	15	15	U	15	15	U	15	31	U	31
1,2-Dichlorobenzene	ug/m3	12	U	12	12	U	12	12	U	12	12	U	12	24	U	24
1,2-Dichloroethane	ug/m3	8	U	8	8	U	8	8	U	8	8	U	8	16	U	16
1,2-Dichloropropane	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	18	U	18
1,2-Dichlorotetrafluoroethane	ug/m3	14	U	14	14	U	14	14	U	14	14	U	14	28	U	28
1,3,5-Trimethylbenzene	ug/m3	10	U	10	10	U	10	10	U	10	10	U	10	20	U	20
1,3-Butadiene	ug/m3	35		4	4	U	4	20		4	12		4	9	U	9
1,3-Dichlorobenzene	ug/m3	12	U	12	12	U	12	12	U	12	12	U	12	24	U	24
1,4-Dichlorobenzene	ug/m3	12	U	12	12	U	12	12	U	12	12	U	12	24	U	24
1,4-Dioxane	ug/m3	180	U	180	180	U	180	180	U	180	180	U	180	360	U	360
2,2,4-Trimethylpentane	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	19	U	19
2-Chlorotoluene	ug/m3	10	U	10	10	U	10	10	U	10	10	U	10	21	U	21
3-Chloropropene	ug/m3	16	U	16	16	U	16	16	U	16	16	U	16	31	U	31
4-Ethyltoluene	ug/m3	10	U	10	10	U	10	10	U	10	10	U	10	20	U	20
Acetone	ug/m3	1500	D	360	120	U	120	990	D	360	790		120	4700	D	1200
Benzene	ug/m3	8		6	6	U	6	12		6	7		6	13	U	13
Bromodichloromethane	ug/m3	13	U	13	13	U	13	13	U	13	13	U	13	27	U	27
Bromoethene(Vinyl Bromide)	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	17	U *	17
Bromoform	ug/m3	21	U	21	21	U	21	21	U	21	21	U	21	41	U	41
Bromomethane	ug/m3	8	U	8	8	U	8	8	U	8	8	U	8	16	U	16
Carbon disulfide	ug/m3	19		16	16	U	16	16	U	16	16	U	16	31	U	31
Carbon tetrachloride	ug/m3	13	U	13	13	U	13	13	U	13	13	U	13	25	U	25
Chlorobenzene	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	18	U	18
Chloroethane	ug/m3	13	U	13	13	U	13	13	U	13	13	U	13	26	U *	26

Table 3
 Summary of Soil Vapor Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	SV-19			SV-20			SV-21			SV-22			SV-23		
Lab Sample ID		200-48908-12			200-48908-10			200-48908-11			200-48908-13			200-48908-1		
Sampling Date/Time		05/21/2019 12:25:00			05/21/2019 11:45:00			05/21/2019 12:10:00			05/21/2019 12:45:00			05/21/2019 09:20:00		
Chloroform	ug/m3	10	U	10	10	U	10	29		10	10	U	10	20	U	20
Chloromethane	ug/m3	10	U	10	10	U	10	10	U	10	10	U	10	21	U	21
cis-1,2-Dichloroethene	ug/m3	8	U	8	8	U	8	8	U	8	8	U	8	16	U	16
cis-1,3-Dichloropropene	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	18	U	18
Cyclohexane	ug/m3	7	U	7	7	U	7	7	U	7	7	U	7	14	U	14
Dibromochloromethane	ug/m3	17	U	17	17	U	17	17	U	17	17	U	17	34	U	34
Dichlorodifluoromethane	ug/m3	25	U	25	25	U	25	25	U	25	25	U	25	49	U	49
Ethanol	ug/m3	94	U	94	94	U	94	94	U	94	94	U	94	190	U	190
Ethylbenzene	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	17	U	17
Freon TF	ug/m3	15	U	15	15	U	15	15	U	15	15	U	15	31	U	31
Hexachlorobutadiene	ug/m3	21	U	21	21	U	21	21	U	21	21	U	21	43	U	43
Isopropyl alcohol	ug/m3	120	U	120	120	U	120	120	U	120	120	U	120	250	U	250
m,p-Xylene	ug/m3	22	U	22	22	U	22	22	U	22	22	U	22	43	U	43
Methyl Ethyl Ketone	ug/m3	70		15	15	U	15	51		15	28		15	340		29
methyl isobutyl ketone	ug/m3	20	U	20	20	U	20	20	U	20	20	U	20	41	U	41

Table 3
Summary of Soil Vapor Sampling Results
Volatile Organic Compounds
1510 Broadway, Brooklyn, NY

Sample ID	Units	SV-19			SV-20			SV-21			SV-22			SV-23		
Lab Sample ID		200-48908-12			200-48908-10			200-48908-11			200-48908-13			200-48908-1		
Sampling Date/Time		05/21/2019 12:25:00			05/21/2019 11:45:00			05/21/2019 12:10:00			05/21/2019 12:45:00			05/21/2019 09:20:00		
Methyl methacrylate	ug/m3	20	U	20	20	U	20	20	U	20	20	U	20	41	U	41
Methyl tert-butyl ether	ug/m3	7	U	7	7	U	7	7	U	7	7	U	7	14	U*	14
Methylene Chloride	ug/m3	17	U	17	17	U	17	17	U	17	17	U	17	35	U	35
n-Heptane	ug/m3	76		8	8	U	8	9		8	12		8	16	U	16
n-Hexane	ug/m3	120		7	7	U	7	16		7	18		7	17		14
Styrene	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	17	U	17
tert-Butyl alcohol	ug/m3	150	U	150	150	U	150	150	U	150	150	U	150	300	U	300
Tetrachloroethene	ug/m3	14	U	14	14	U	14	15		14	14	U	14	39		27
Tetrahydrofuran	ug/m3	150	U	150	150	U	150	150	U	150	150	U	150	290	U	290
Toluene	ug/m3	52		8	8	U	8	10		8	8	U	8	15	U	15
trans-1,2-Dichloroethene	ug/m3	8	U	8	8	U	8	8	U	8	8	U	8	16	U	16
trans-1,3-Dichloropropene	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	18	U	18
Trichloroethene	ug/m3	400		11	11	U	11	11	U	11	11	U	11	21	U	21
Trichlorofluoromethane	ug/m3	50		11	11	U	11	11	U	11	11	U	11	22	U	22
Vinyl chloride	ug/m3	5	U	5	5	U	5	5	U	5	5	U	5	10	U	10
Xylene, o-	ug/m3	9	U	9	9	U	9	9	U	9	9	U	9	17	U*	17

Notes:

Q = Qualifier

ug/m3 = Micrograms per meter cubed

U =Indicates the analyte was analyzed
for but not detected

D = Indicates sample dilution was
required for analysis

Conc - Concentration

MDL - Minimum Detection Limit

Table 3
Summary of Soil Vapor Sampling Results
Volatile Organic Compounds
1510 Broadway, Brooklyn, NY

Sample ID	Units	SV-24			SV-25			AMBIENT		
Lab Sample ID		200-48908-9			200-48908-4			200-48908-7		
Sampling Date/Time		05/21/2019 11:35:00			05/21/2019 10:15:00			05/21/2019 10:55:00		
		Conc	Q	MDL	Conc	Q	MDL	Conc	Q	MDL
AIR_UGM3 BY TO-15										
1,1,1-Trichloroethane	ug/m3	11	U	11	11	U	11	1	U	1
1,1,2,2-Tetrachloroethane	ug/m3	14	U	14	14	U	14	1	U	1
1,1,2-Trichloroethane	ug/m3	11	U	11	11	U	11	1	U	1
1,1-Dichloroethane	ug/m3	8	U	8	8	U	8	0.8	U	0.8
1,1-Dichloroethene	ug/m3	8	U	8	8	U	8	0.8	U	0.8
1,2,4-Trichlorobenzene	ug/m3	37	U	37	37	U	37	4	U	4
1,2,4-Trimethylbenzene	ug/m3	10	U	10	10	U	10	1	U	1
1,2-Dibromoethane	ug/m3	15	U	15	15	U	15	2	U	2
1,2-Dichlorobenzene	ug/m3	12	U	12	12	U	12	1	U	1
1,2-Dichloroethane	ug/m3	8	U	8	8	U	8	0.8	U	0.8
1,2-Dichloropropane	ug/m3	9	U	9	9	U	9	0.9	U	0.9
1,2-Dichlorotetrafluoroethane	ug/m3	14	U	14	14	U	14	1	U	1
1,3,5-Trimethylbenzene	ug/m3	10	U	10	10	U	10	1	U	1
1,3-Butadiene	ug/m3	37		4	16		4	0.4	U	0.4
1,3-Dichlorobenzene	ug/m3	12	U	12	12	U	12	1	U	1
1,4-Dichlorobenzene	ug/m3	12	U	12	12	U	12	1	U	1
1,4-Dioxane	ug/m3	180	U	180	180	U	180	18	U	18
2,2,4-Trimethylpentane	ug/m3	9	U	9	9	U	9	0.9	U	0.9
2-Chlorotoluene	ug/m3	10	U	10	10	U	10	1	U	1
3-Chloropropene	ug/m3	16	U	16	16	U	16	2	U	2
4-Ethyltoluene	ug/m3	10	U	10	10	U	10	1	U	1
Acetone	ug/m3	540		120	1500		360	12	U	12
Benzene	ug/m3	24		6	10		6	0.6	U	0.6
Bromodichloromethane	ug/m3	13	U	13	13	U	13	1	U	1
Bromoethene(Vinyl Bromide)	ug/m3	9	U	9	9	U	9	0.9	U	0.9
Bromoform	ug/m3	21	U	21	21	U	21	2	U	2
Bromomethane	ug/m3	8	U	8	8	U	8	0.8	U	0.8
Carbon disulfide	ug/m3	16		16	16	U	16	2	U	2
Carbon tetrachloride	ug/m3	13	U	13	13	U	13	1	U	1
Chlorobenzene	ug/m3	9	U	9	9	U	9	0.9	U	0.9
Chloroethane	ug/m3	13	U	13	13	U	13	1	U	1

Table 3
 Summary of Soil Vapor Sampling Results
 Volatile Organic Compounds
 1510 Broadway, Brooklyn, NY

Sample ID	Units	SV-24			SV-25			AMBIENT		
Lab Sample ID		200-48908-9			200-48908-4			200-48908-7		
Sampling Date/Time		05/21/2019 11:35:00			05/21/2019 10:15:00			05/21/2019 10:55:00		
Chloroform	ug/m3	10	U	10	10	U	10	1	U	1
Chloromethane	ug/m3	10	U	10	10	U	10	1		1
cis-1,2-Dichloroethene	ug/m3	8	U	8	8	U	8	0.8	U	0.8
cis-1,3-Dichloropropene	ug/m3	9	U	9	9	U	9	0.9	U	0.9
Cyclohexane	ug/m3	9		7	7	U	7	0.7	U	0.7
Dibromochloromethane	ug/m3	17	U	17	17	U	17	2	U	2
Dichlorodifluoromethane	ug/m3	25	U	25	25	U	25	2	U	2
Ethanol	ug/m3	94	U	94	94	U	94	9	U	9
Ethylbenzene	ug/m3	9	U	9	9	U	9	0.9	U	0.9
Freon TF	ug/m3	15	U	15	15	U	15	2	U	2
Hexachlorobutadiene	ug/m3	21	U	21	21	U	21	2	U	2
Isopropyl alcohol	ug/m3	120	U	120	120	U	120	12	U	12
m,p-Xylene	ug/m3	22	U	22	22	U	22	2	U	2
Methyl Ethyl Ketone	ug/m3	65		15	110		15	1	U	1
methyl isobutyl ketone	ug/m3	20	U	20	20	U	20	2	U	2

Table 3
Summary of Soil Vapor Sampling Results
Volatile Organic Compounds
1510 Broadway, Brooklyn, NY

Sample ID	Units	SV-24			SV-25			AMBIENT		
Lab Sample ID		200-48908-9			200-48908-4			200-48908-7		
Sampling Date/Time		05/21/2019 11:35:00			05/21/2019 10:15:00			05/21/2019 10:55:00		
Methyl methacrylate	ug/m3	20	U	20	20	U	20	2	U	2
Methyl tert-butyl ether	ug/m3	7	U	7	7	U	7	0.7	U	0.7
Methylene Chloride	ug/m3	17	U	17	17	U	17	2	U	2
n-Heptane	ug/m3	49		8	17		8	0.8	U	0.8
n-Hexane	ug/m3	83		7	28		7	0.7	U	0.7
Styrene	ug/m3	9	U	9	9	U	9	0.9	U	0.9
tert-Butyl alcohol	ug/m3	150	U	150	150	U	150	15	U	15
Tetrachloroethene	ug/m3	14	U	14	14		14	1	U	1
Tetrahydrofuran	ug/m3	150	U	150	150	U	150	15	U	15
Toluene	ug/m3	13		8	9		8	0.8	U	0.8
trans-1,2-Dichloroethene	ug/m3	8	U	8	8	U	8	0.8	U	0.8
trans-1,3-Dichloropropene	ug/m3	9	U	9	9	U	9	0.9	U	0.9
Trichloroethene	ug/m3	11	U	11	11	U	11	1	U	1
Trichlorofluoromethane	ug/m3	11	U	11	25		11	1	U	1
Vinyl chloride	ug/m3	5	U	5	5	U	5	0.5	U	0.5
Xylene, o-	ug/m3	9	U	9	9	U	9	0.9	U	0.9

Notes:

Q = Qualifier

ug/m3 = Micrograms per meter cubed

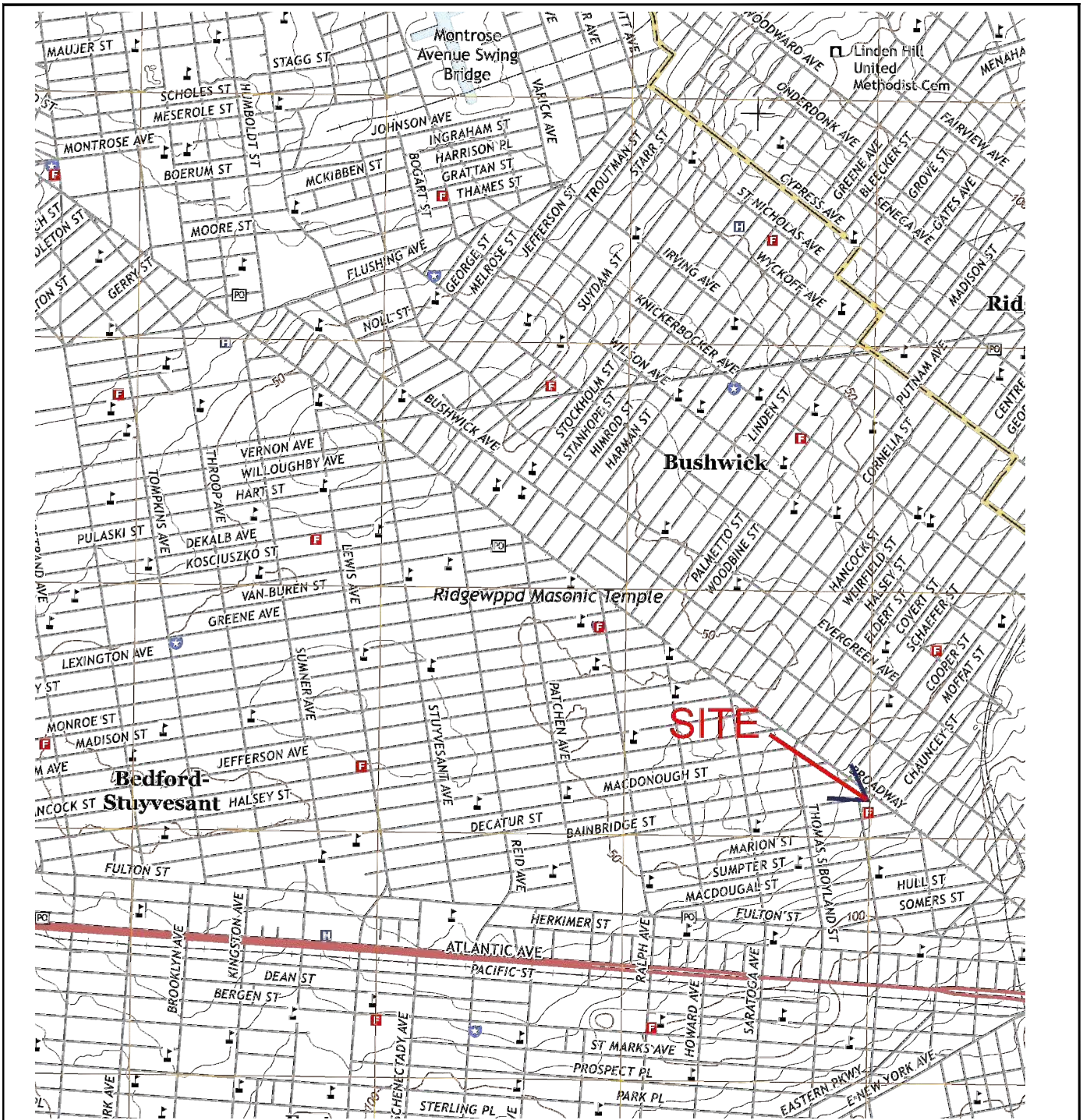
U =Indicates the analyte was analyzed
for but not detected

D = Indicates sample dilution was
required for analysis

Conc - Concentration

MDL - Minimum Detection Limit

FIGURES

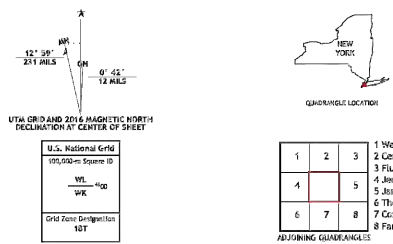


Produced by the United States Geological Survey
 North American Datum of 1983 (NAD83)
 World Geodetic System of 1984 (WGS84). Projection and
 1000-meter grid: Universal Transverse Mercator, Zone 18T
 10 000-foot Grid: New York Coordinate System of 1983 (Long
 Island zone)

This map is not a legal document. Boundaries may be
 generalized for this map scale. Private lands within government
 reservations may not be shown. Obtain permission before
 entering private lands.

Insurgency.....NAIP, June 2013
 Roads.....U.S. Census Bureau, 2015 - 2016
 Names.....GNIS, 2016
 Hydrography.....National Hydrography Dataset, 2013
 Contours.....National Elevation Dataset, 2015
 Boundaries.....Multiple sources; see metadata file 1977 - 2016

Wetlands.....FWS National Wetlands Inventory 1977 - 2014



BROOKLYN, NY
 2016

FIG-1.1

1510 BROADWAY
 DRY CLEANERS SITE
 BROOKLYN, NEW YORK

SITE LOCATION MAP

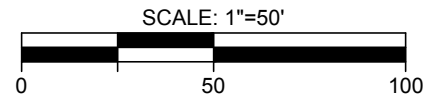
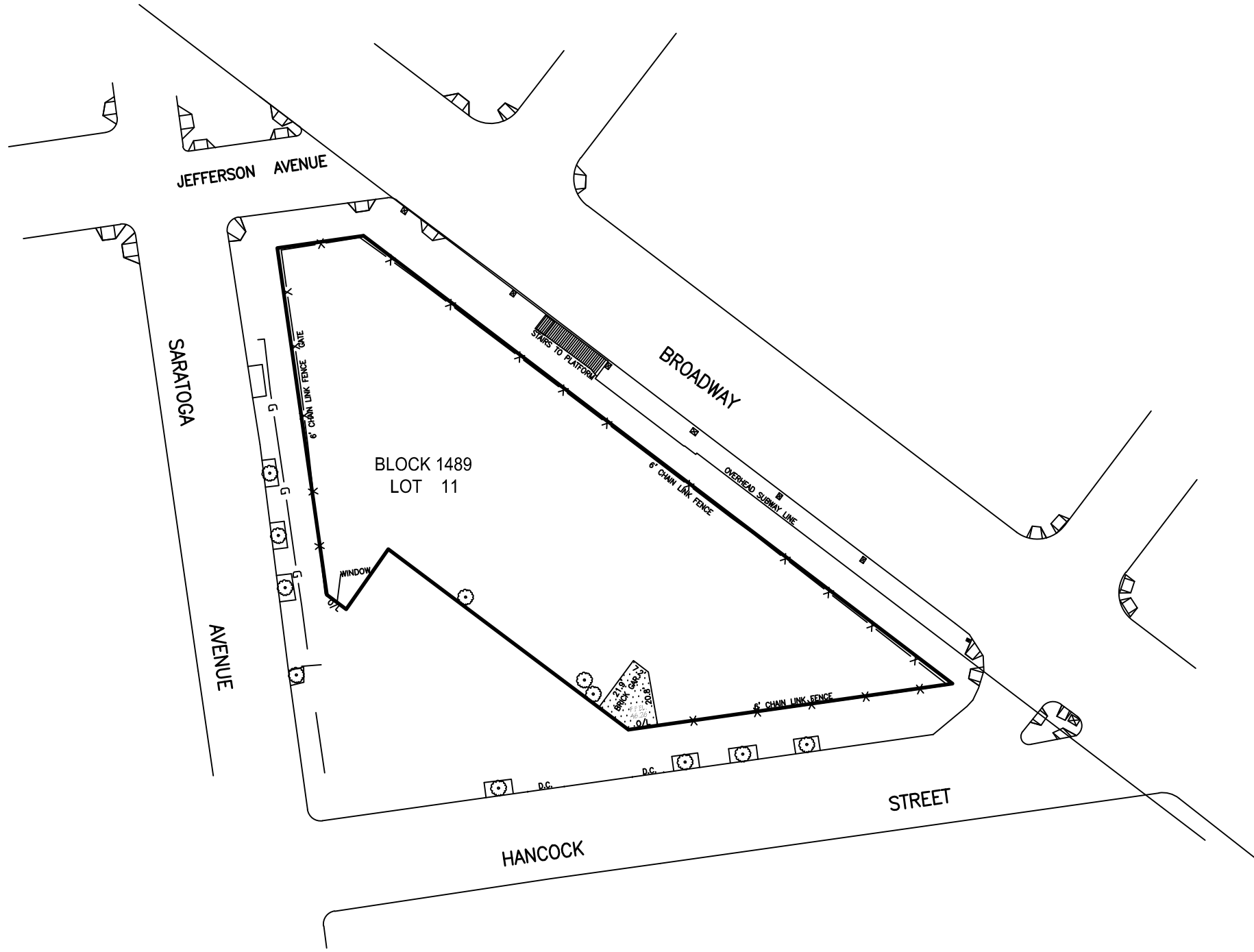
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SOILS / FOUNDATIONS
 SITE DESIGN
 ENVIRONMENTAL

12A MAPLE AVE. PINE BROOK, N.J. 07058 PH: 973-808-9050

DRAWN BY: yy
CHECKED BY: TK
SCALE: N.T.S.
DATE: 6/27/19
JOB NO.: 9753

N:\ACAD\9753\RIR\9753 FIG-1.2 SITE PLAN.DWG 10/03/19 02:53:26PM jenny_LAYOUT:FIG-1.2



LEGEND

————— PROJECT SITE BOUNDARY

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dwg by: yy
chk by: FD
scale: 1" = 50'
date: 10/03/19

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SOILS / FOUNDATIONS
SITE DESIGN
ENVIRONMENTAL
12A MAPLE AVE. PINE BROOK, N.J. 07058 PH: 973-808-9050

project: 1510 BROADWAY
DRY CLEANERS SITE
BROOKLYN, NEW YORK

drawing title: **SITE PLAN**

job no: 9753
drawing no:

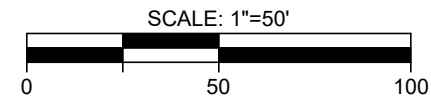
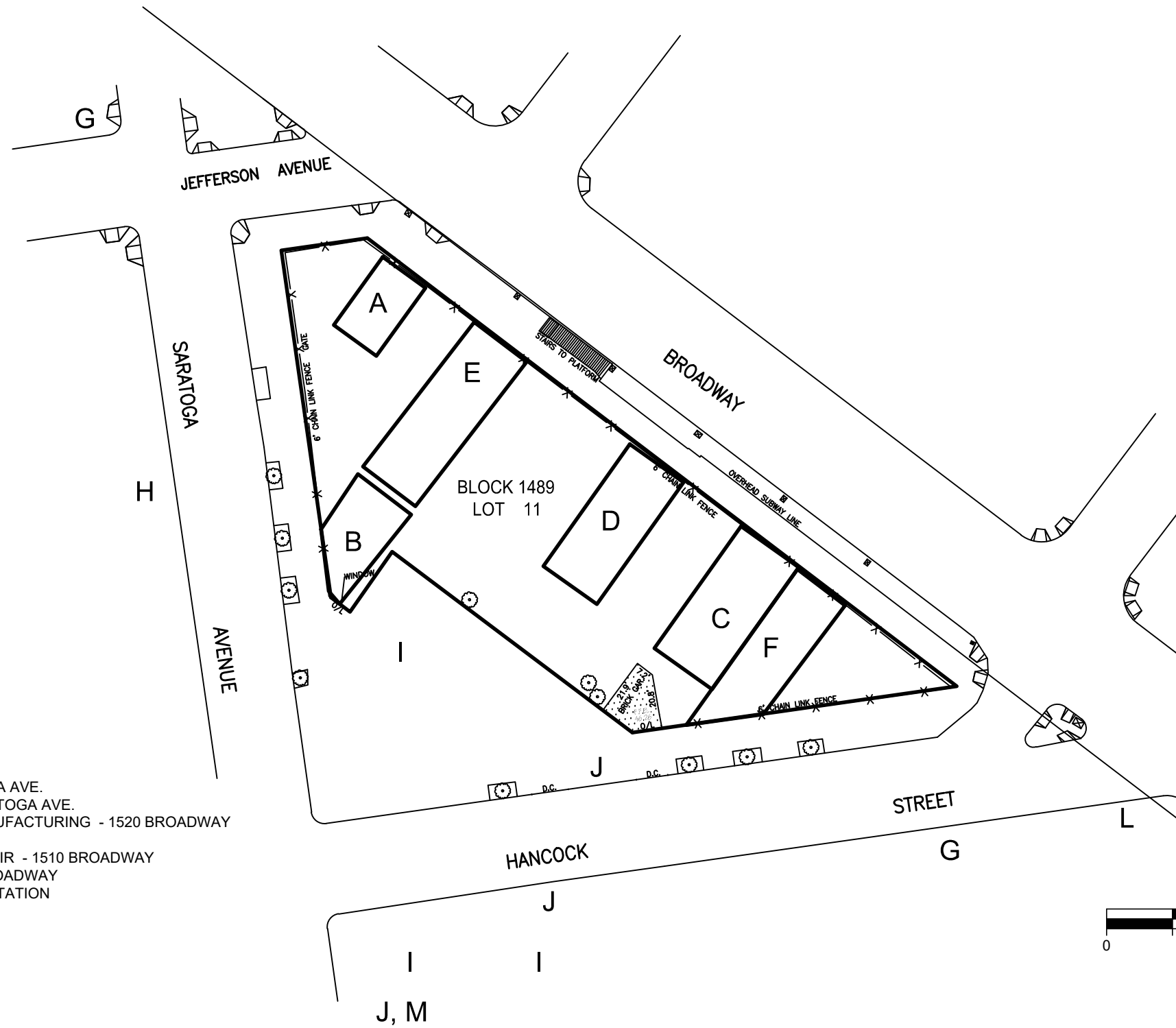
FIG-1.2

N:\ACAD\9753\RIR\9753 FIG-2.1 HISTORIC OPERATIONS PLAN.DWG 12/17/20 08:41:13AM. aas, LAYOUT: FIG-2.1

NOTES:

- A = HISTORICAL DRY CLEANER - 7 SARATOGA AVE.
- B = HISTORICAL MANUFACTURING - 15 SARATOGA AVE.
- C = HISTORICAL DRY CLEANER /DRESS MANUFACTURING - 1520 BROADWAY
- D = HISTORICAL PRINTER - 1516 BROADWAY
- E = HISTORICAL WATCH AND JEWELRY REPAIR - 1510 BROADWAY
- F = HISTORICAL PAINTS AND OILS - 1522 BROADWAY
- G = HISTORICAL NYC TRANSIT AUTHORITY STATION
- H - HISTORICAL LAUNDRY
- I = HISTORICAL GARAGE
- J = HISTORICAL GAS TANK
- K = HISTORICAL WHOLESALE AUTO GLASS
- L = HISTORICAL PAINTS
- M = HISTORICAL WAREHOUSE

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LEGEND

————— PROJECT SITE BOUNDARY

project: 1510 BROADWAY
 DRY CLEANERS SITE
 BROOKLYN, NEW YORK

drawing title: HISTORIC OPERATIONS PLAN

job no: 9753
 drawing no:

FIG-2.1

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 SITE DESIGN
 ENVIRONMENTAL

12A MAPLE AVE. PINE BROOK, N.J. 07058 PH: 973-808-9050

dwg by: yy
 chk by: FD
 scale: 1" = 50'
 date: 12/17/2020

\\SES\2013\DATA\CAD\9753\RAWP\9753 - FIG-2.2A - 2.5 SOIL SAMPLE FIGURES.DWG 07/24/20 04:15:06PM, aas, LAYOUT:FIG-2.2A

Table for Sample No. SB-31(1-1.5) to SB-31(16.5-17) showing depth, date, and concentration of various parameters like 4,4'-DDD, 4,4'-DDE, etc.

Table for Sample No. SB-36(2-2.5) to SB-36(13-13.5) showing depth, date, and concentration of various parameters like 4,4'-DDD, 4,4'-DDE, etc.

Table for Sample No. SB-35(4.5-5.0) to SB-35(19-19.5) showing depth, date, and concentration of various parameters like 4,4'-DDD, 4,4'-DDE, etc.

Table for Sample No. SB-34(1.5-2.0) to SB-34(9-9.5) showing depth, date, and concentration of various parameters like 4,4'-DDD, 4,4'-DDE, etc.

Table for Sample No. SB-30(2-2.5) to SB-30(16.5-17.0) showing depth, date, and concentration of various parameters like 4,4'-DDD, 4,4'-DDE, etc.

Table for Sample No. SB-23(4-4.5) to SB-23(12.5-13.0) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-15(2-2.5) to SB-15(12.5-13) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-20(4.5-5) to SB-20(16-16.5) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-20(4.5-5) to SB-20(16-16.5) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-32(4-4.5) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-32(7-7.5) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-32(14.5-15) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-32(18-18.5) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-29(3-3.5) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-29(7-7.5) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-29(14.5-15) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-19(2-2.5) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-19(13.5-14) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-19(17-17.5) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-22(3.5-4) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-16(4-4.5) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

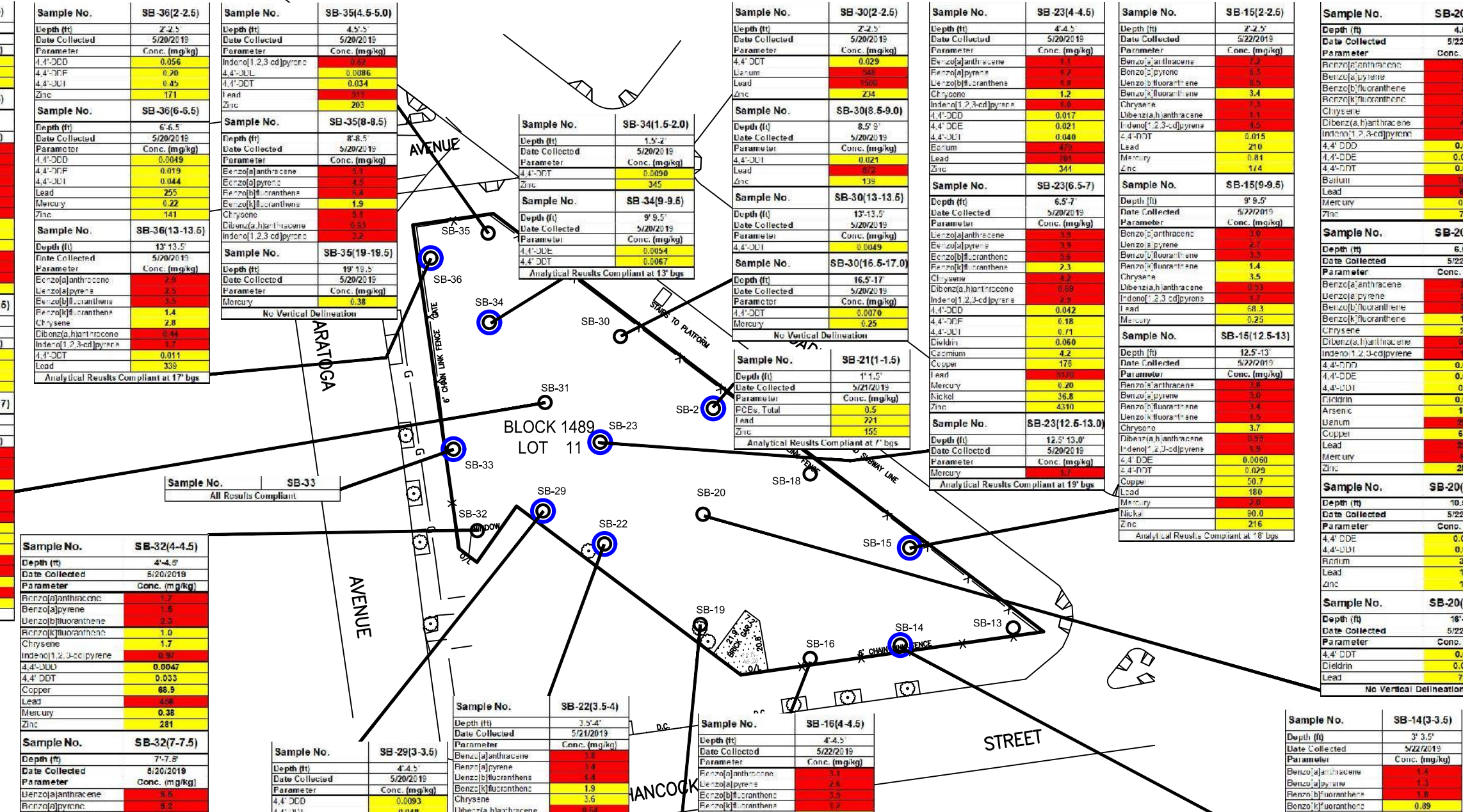
Table for Sample No. SB-16(9.5-10) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-16(11.5-12) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

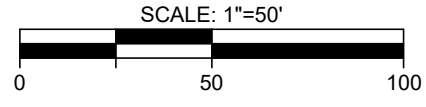
Table for Sample No. SB-16(16-16.5) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-14(3-3.5) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.

Table for Sample No. SB-14(8-8.5) showing depth, date, and concentration of various parameters like Benzo[a]anthracene, Benzo[a]pyrene, etc.



LEGEND section defining symbols for project site boundary, soil boring location, fence, and concentration levels (614 and 888). Includes a NOTE section with instructions on data interpretation and units.



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Project information including project name (SOIL BORING SAMPLE RESULTS PLAN), location (1510 BROADWAY DRY CLEANERS SITE BROOKLYN, NEW YORK), drawing title, job number (9753), drawing number, and contact information for SESI CONSULTING ENGINEERS D.P.C.

\\SES\2013\DATA\CAD\9753\RAWP\9753 - FIG-2.2A - 2.5 SOIL SAMPLE FIGURES.DWG 07/24/20 04:16:10PM, oas, LAYOUT:FIG-2.2B

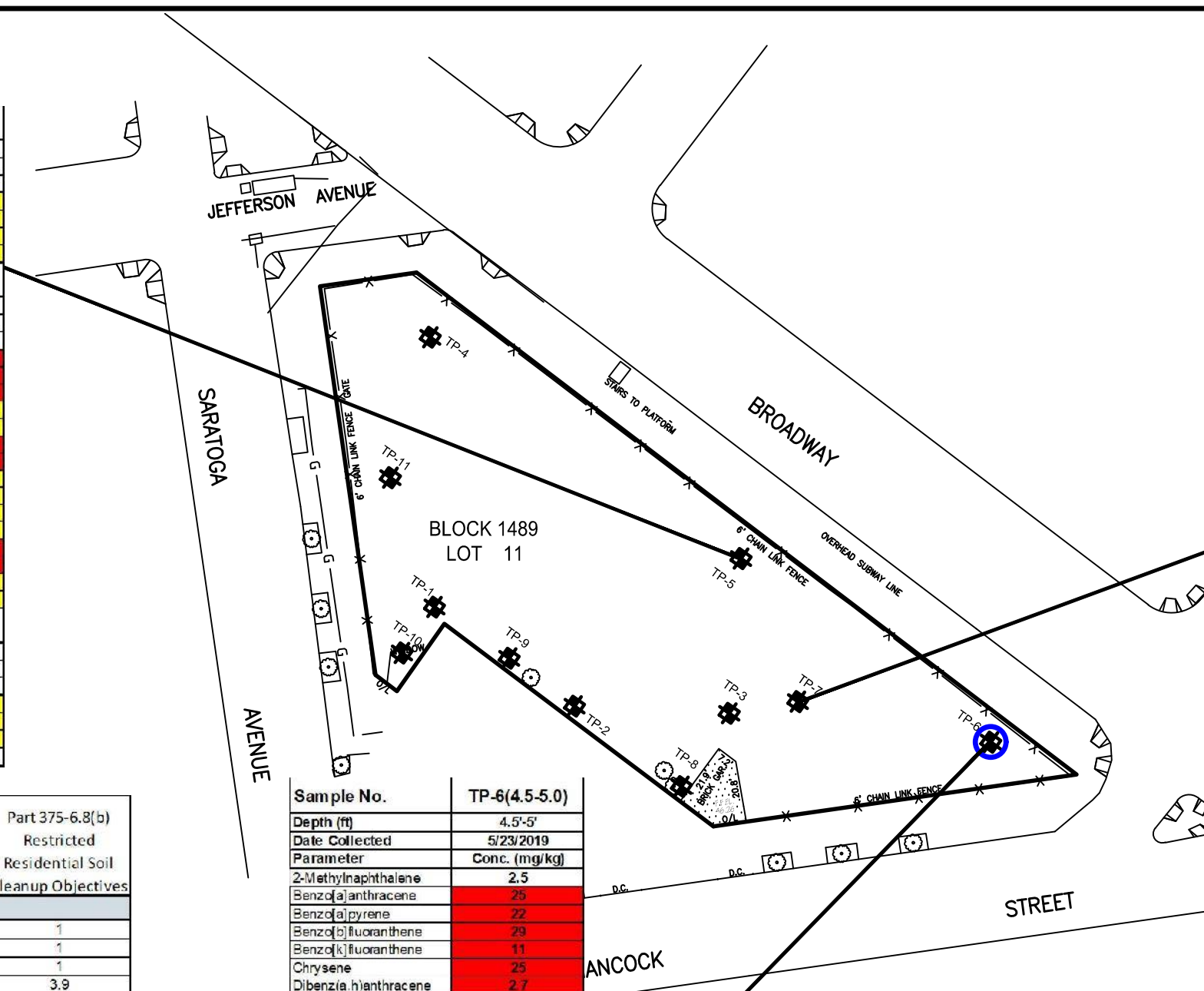
Sample No.	TP-5(4.5-5.0)
Depth (ft)	4.5'-5'
Date Collected	5/23/2019
Parameter	Conc. (mg/kg)
4,4'-DDT	0.0098
Lead	156
Mercury	0.52
Zinc	153

Sample No.	TP-5(9.5-10.0)
Depth (ft)	9.5'-10'
Date Collected	5/23/2019
Parameter	Conc. (mg/kg)
Benzo[a]anthracene	2.5
Benzo[a]pyrene	2.3
Benzo[b]fluoranthene	3.3
Benzo[k]fluoranthene	1.0
Chrysene	2.6
Dibenz(a,h)anthracene	0.34
Indeno[1,2,3-cd]pyrene	1.4
4,4'-DDD	0.031
4,4'-DDE	0.044
4,4'-DDT	0.37
Dieldrin	0.093
Barium	757
Lead	891
Mercury	0.42
Zinc	483

Sample No.	TP-5(12-12.5)
Depth (ft)	12'-12.5'
Date Collected	5/23/2019
Parameter	Conc. (mg/kg)
4,4'-DDD	0.0084
4,4'-DDE	0.011
4,4'-DDT	0.063

No Vertical Delineation

	Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives	Part 375-6.8(b) Restricted Residential Soil Cleanup Objectives
SVOCs		
Benzo[a]anthracene	1	1
Benzo[a]pyrene	1	1
Benzo[b]fluoranthene	1	1
Benzo[k]fluoranthene	0.8	3.9
Chrysene	1	3.9
Dibenz(a,h)anthracene	0.33	0.33
Indeno[1,2,3-cd]pyrene	0.5	0.5
Pesticides		
4,4'-DDD	0.0033	13
4,4'-DDE	0.0033	8.9
4,4'-DDT	0.0033	7.9
Dieldrin	0.005	0.2
Metals		
Arsenic	13	18
Barium	350	400
Cadmium	2.5	4.3
Copper	50	270
Lead	83	400
Mercury	0.18	0.81
Nickel	30	310
Zinc	109	
PCBs		
Total PCBs	0.1	1



Sample No.	TP-6(4.5-5.0)
Depth (ft)	4.5'-5'
Date Collected	5/23/2019
Parameter	Conc. (mg/kg)
2-Methylnaphthalene	2.5
Benzo[a]anthracene	25
Benzo[a]pyrene	22
Benzo[b]fluoranthene	29
Benzo[k]fluoranthene	11
Chrysene	25
Dibenz(a,h)anthracene	2.7
Indeno[1,2,3-cd]pyrene	14
4,4'-DDD	0.015
4,4'-DDE	0.063
4,4'-DDT	0.19
Barium	605
Lead	1620
Mercury	0.48
Zinc	822

Sample No.	TP-6(9-9.5)
Depth (ft)	9'-9.5'
Date Collected	5/23/2019
Parameter	Conc. (mg/kg)
Benzo[a]anthracene	1.4
Benzo[a]pyrene	1.4
Benzo[b]fluoranthene	2.1
Chrysene	1.5
Indeno[1,2,3-cd]pyrene	0.75
4,4'-DDE	0.037
4,4'-DDT	0.11
Dieldrin	0.015
Copper	56.9
Lead	486
Mercury	0.93
Zinc	436

Analytical Results Compliant at 11' bgs

LEGEND

- PROJECT SITE BOUNDARY
- SOIL SAMPLE LOCATION
- FENCE
- EXCEEDS THE NYSDEC UNRESTRICTED USE SCO
- EXCEEDS THE NYSDEC RESTRICTED RESIDENTIAL USE SCO
- VERTICAL DELINEATION ACHIEVED

SAMPLE DEPTHS PROVIDED IN TABLE 1 AND TABLE 2A - TABLE 2F

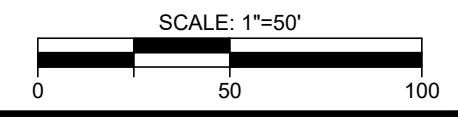
- NOTE
- ENVIRONMENTAL SAMPLES WERE COLLECTED AT TEST PITS; TP-5, TP-6, AND TP-7 ONLY. ADDITIONAL TEST PITS COMPLETED TO SUPPORT FUTURE CONSTRUCTION AND SITE DEVELOPMENT ACTIVITIES.
 - mg/kg = MILLIGRAMS PER KILOGRAM

Sample No.	TP-7(4.5-5.0)
Depth (ft)	4.5'-5'
Date Collected	5/23/2019
Parameter	Conc. (mg/kg)
Benzo[a]anthracene	3.3
Benzo[a]pyrene	2.9
Benzo[b]fluoranthene	4.4
Benzo[k]fluoranthene	1.8
Chrysene	3.2
Dibenz(a,h)anthracene	0.41
Indeno[1,2,3-cd]pyrene	1.5
4,4'-DDE	0.018
4,4'-DDT	0.080
Dieldrin	0.0072
Lead	79.3

Sample No.	TP-7(8-8.5)
Depth (ft)	8'-8.5'
Date Collected	5/23/2019
Parameter	Conc. (mg/kg)
Benzo[a]anthracene	6.6
Benzo[a]pyrene	6.0
Benzo[b]fluoranthene	7.8
Benzo[k]fluoranthene	3.2
Chrysene	6.5
Dibenz(a,h)anthracene	0.52
Indeno[1,2,3-cd]pyrene	3.2
4,4'-DDD	0.037
4,4'-DDE	0.060
4,4'-DDT	0.22
Dieldrin	0.021
PCBs, Total	0.11
Barium	394
Lead	685
Mercury	0.37
Nickel	30.4
Zinc	614

Sample No.	TP-7(10-10.5)
Depth (ft)	10'-10.5'
Date Collected	5/23/2019
Parameter	Conc. (mg/kg)
Benzo[a]anthracene	5.7
Benzo[a]pyrene	4.3
Benzo[b]fluoranthene	6.5
Benzo[k]fluoranthene	2.1
Chrysene	5.9
Dibenz(a,h)anthracene	0.68
Indeno[1,2,3-cd]pyrene	1.9
4,4'-DDD	0.015
4,4'-DDE	0.021
4,4'-DDT	0.090
Dieldrin	0.011
Barium	689
Lead	723
Mercury	0.44
Zinc	425

No Vertical Delineation



dwg by: yy
chk by: FD
scale: AS NOTED
date: 07/24/2020

SOILS / FOUNDATIONS
SITE DESIGN
ENVIRONMENTAL

SESI

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12A MAPLE AVE. PINE BROOK, N.J. 07058 PH: 973-808-9050

project: 1510 BROADWAY
DRY CLEANERS SITE
BROOKLYN, NEW YORK

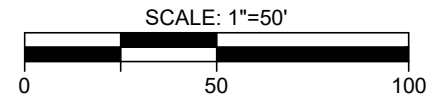
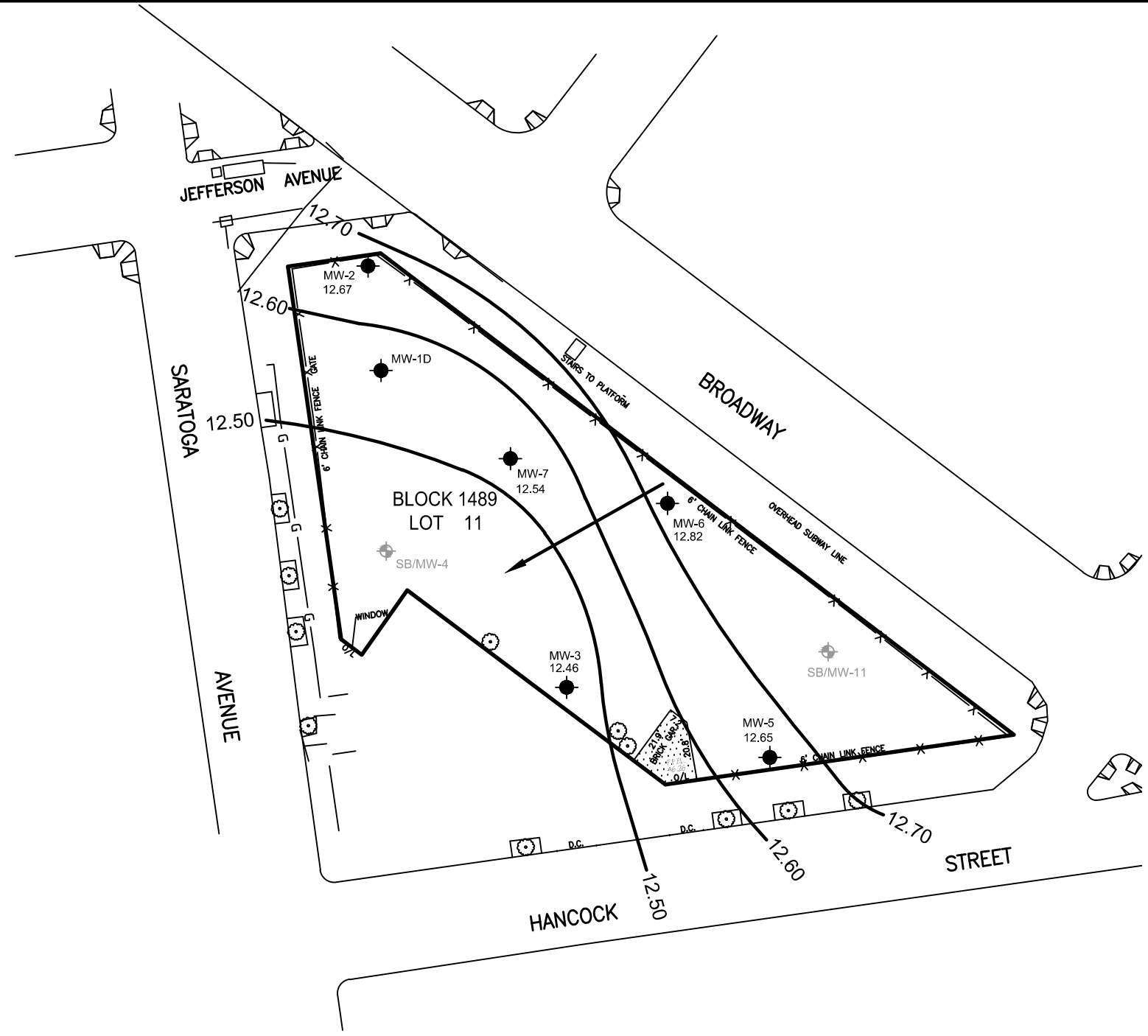
drawing title: TEST PIT SAMPLE RESULTS PLAN

job no: 9753
drawing no:

FIG-2.2B






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\\SES2013\DATA\ACAD\9753\RAWP\9753 - GW CONTOUR MAP.DWG 07/24/20 04:16:41PM, aas, LAYOUT: FIG-2.3



NOTE:
ELEVATION IN FEET ABOVE MEAN SEA LEVEL.

LEGEND

-  PROJECT SITE BOUNDARY
-  SB/MW-11 EXISTING MONITORING WELL LOCATION (AKRF)
-  MW-5 12.65 EXISTING MONITORING WELL LOCATION (SESI) WITH GROUNDWATER ELEVATION (06/03/19)
-  FENCE
-  12.50 GROUNDWATER CONTOUR ELEVATION LINE (FT)

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<p>project: 1510 BROADWAY DRY CLEANERS SITE BROOKLYN, NEW YORK</p>	<p>drawing title: GROUNDWATER CONTOUR MAP</p>	<p>job no: 9753 drawing no:</p>
<p>SESI CONSULTING ENGINEERS D.P.C.</p> <p>SOILS / FOUNDATIONS SITE DESIGN ENVIRONMENTAL</p> <p>12A MAPLE AVE. PINE BROOK, N.J. 07058 PH: 973-808-9050</p>		
<p>dwg by: yy chk by: FD scale: N.T.S. date: 07/24/2020</p>		

FIG-2.3

\\SES\2013\DATA\ACAD\9753\RAWP\9753 - FIG-2.2A - 2.5 SOIL SAMPLE FIGURES.DWG 07/27/20 12:41:28PM, oas, LAYOUT:FIG-2.4



Sample No.	MW-2
Depth (ft)	36.85
Date Collected	6/3/2019
Parameter	Conc. (ppb)
Tetrachloroethene	19
Iron	2640
Manganese	921

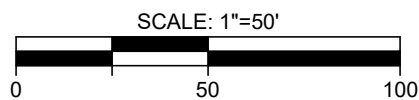
Sample No.	MW-1D
Depth (ft)	37.60
Date Collected	6/3/2019
Parameter	Conc. (ppb)
Tetrachloroethene	34
Iron	392
Magnesium	46500
Manganese	528

Sample No.	MW-8
Depth (ft)	*
Date Collected	2/25/2020
Parameter	Conc. (ppb)
Chloroform	1.1
Tetrachloroethene	37

Sample No.	MW-4
Depth (ft)	34.52
Date Collected	6/6/2019
Parameter	Conc. (ppb)
Tetrachloroethene	26

Table 3.1
Well Gauging Data
1510 Broadway, Brooklyn, NY

Well No.	Elevation Top of Casing (ft-msl) *	Depth to Water (ft) From Top of Casing	Groundwater Elevation (ft-msl)
MW-1S	NA	34.33	-
MS-1D	47.59	37.6	9.99
MW-2	49.52	36.85	12.67
MW-3	50.83	38.37	12.46
MW-4	NA	34.52	-
MW-5	50.09	37.44	12.65
MW-6	50.42	37.6	12.82
MW-7	50.39	37.85	12.54
MW-11	NA	34.05	-



Sample No.	MW-1S
Depth (ft)	34.33
Date Collected	6/5/2019
Parameter	Conc. (ppb)
1,2-Dibromoethane	0.22
Iron	408
Tetrachloroethene	22

Sample No.	MW-10	DUP (MW-10)
Depth (ft)	*	*
Date Collected	2/25/2020	2/25/2020
Parameter	Conc. (ppb)	Conc. (ppb)
Chloroform	20	22
Tetrachloroethene	60	67

Sample No.	MW-7
Depth (ft)	37.85
Date Collected	6/5/2019
Parameter	Conc. (ppb)
1,2-Dibromoethane	0.2
Chloroform	12
Iron	1260

Sample No.	MW-6
Depth (ft)	37.6
Date Collected	6/3/2019
Parameter	Conc. (ppb)
Tetrachloroethene	33
Iron	1660
Manganese	1160

Sample No.	MW-11
Depth (ft)	34.05
Date Collected	6/5/2019
Parameter	Conc. (ppb)
Chloroform	36

Sample No.	MW-5
Depth (ft)	37.44
Date Collected	6/4/2019
Parameter	Conc. (ppb)
Chloroform	26
Iron	3510
Manganese	915

Sample No.	MW-9
Depth (ft)	*
Date Collected	2/25/2020
Parameter	Conc. (ppb)
Chloroform	2.9
Tetrachloroethene	23

Sample No.	MW-3
Depth (ft)	38.37
Date Collected	6/4/2019
Parameter	Conc. (ppb)
Tetrachloroethene	13
Iron	1380
Manganese	1340

NYSDEC AWQS	
VOLATILES	
1,2-Dibromoethane	0.0006
Chloroform	7
Tetrachloroethene	5
METALS	
Iron	300
Magnesium	35000
Manganese	300

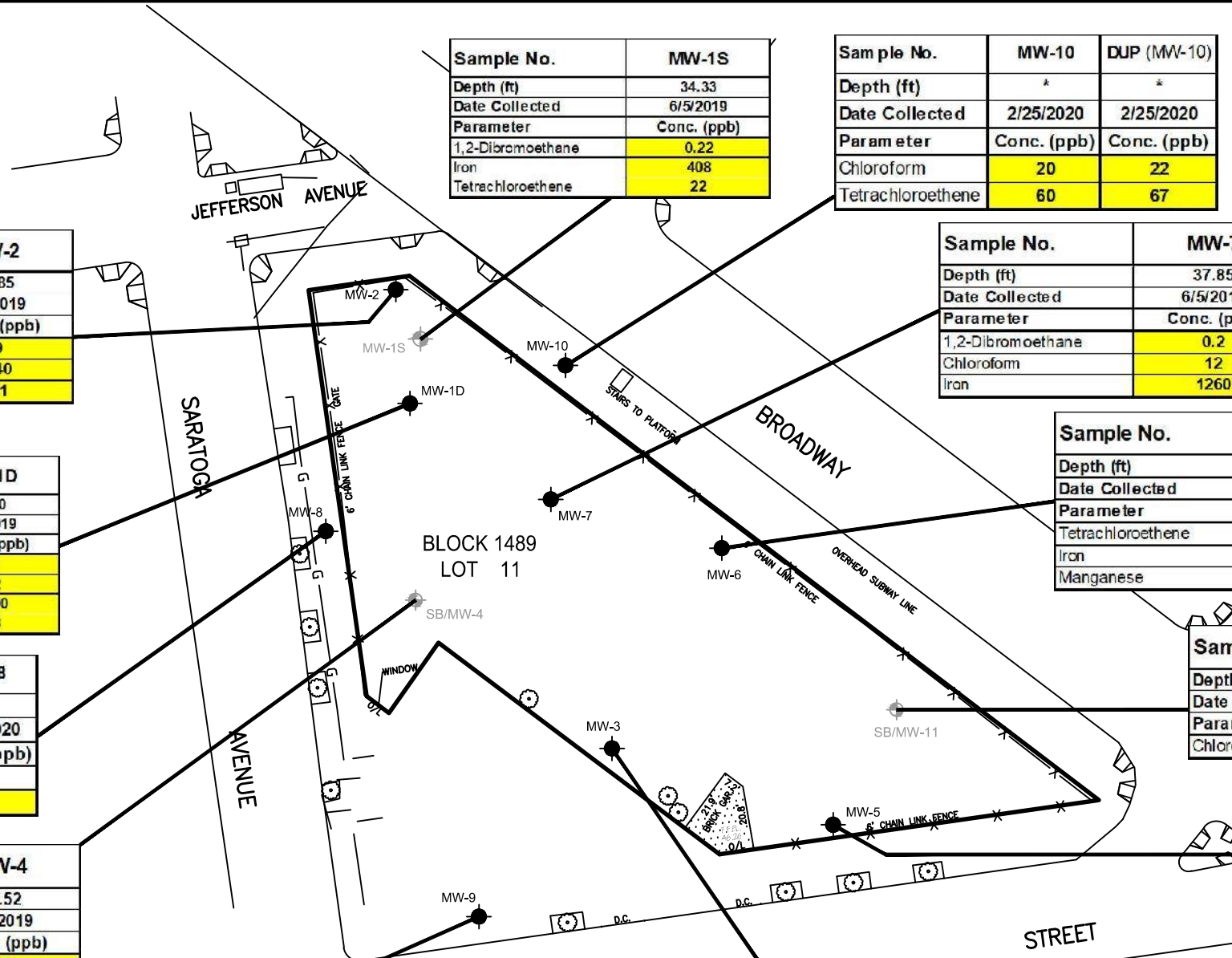
LEGEND

- PROJECT SITE BOUNDARY
- SB/MW-11 ◉ EXISTING MONITORING WELL LOCATION (2017)
- MW-5 ● MONITORING WELL LOCATION (MAY 2019)
- x — x — FENCE

NOTES

- 1) ANALYTICAL DATA NOT SHOWN WAS EITHER NOT DETECTED OR WAS DETECTED AT A CONCENTRATION BELOW UNRESTRICTED USE SCO.
- 2) ppb = PARTS PER BILLION

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chk by: FD
scale: 1"=50'
date: 07/27/2020

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SITE DESIGN
ENVIRONMENTAL
12A MAPLE AVE. PINE BROOK, N.J. 07058 PH: 973-808-9050

project:
1510 BROADWAY
DRY CLEANERS SITE
BROOKLYN, NEW YORK

drawing title: **GROUNDWATER SAMPLE RESULTS PLAN**

job no: 9753
drawing no:

FIG-2.4

\\SES\2013\DATA\ACAD\9753\RAWP\9753 - FIG-2.2A - 2.5 SOIL SAMPLE FIGURES.DWG 07/24/20 04:17:53PM, aas, LAYOUT:FIG-2.5



Sample ID	SV-23
Sample Depth	15' bgs
Sample Date	5/21/2019
Parameter / Units	ug/m3
Acetone	4700
Methyl Ethyl Ketone	340
n-Hexane	17
Tetrachloroethene	39

Sample NO.	SV-13
Sample Depth	15' bgs
Sample Date	5/21/2019
Parameter / Units	ug/m3
1,3-Butadiene	8
Acetone	1300
Methyl Ethyl Ketone	110
n-Heptane	10
n-Hexane	9
Tetrachloroethene	34

Sample ID	SV-14
Sample Depth	15' bgs
Sample Date	5/21/2019
Parameter / Units	ug/m3
1,3-Butadiene	6
Acetone	490
Methyl Ethyl Ketone	47

Sample ID	SV-22
Sample Depth	15' bgs
Sample Date	5/21/2019
Parameter / Units	ug/m3
1,3-Butadiene	12
Acetone	790
Benzene	7
Methyl Ethyl Ketone	28
n-Heptane	12
n-Hexane	18

Sample ID	SV-18
Sample Depth	15' bgs
Sample Date	5/21/2019
Parameter / Units	ug/m3
1,3-Butadiene	120
Acetone	850
Cyclohexane	11
Methyl Ethyl Ketone	32
n-Heptane	11
n-Hexane	38

Sample ID	SV-24
Sample Depth	15' bgs
Sample Date	5/21/2019
Parameter / Units	ug/m3
1,3-Butadiene	37
Acetone	540
Benzene	24
Carbon disulfide	16
Cyclohexane	9
Methyl Ethyl Ketone	65
n-Heptane	49
n-Hexane	83
Toluene	13

Sample ID	SV-16
Sample Depth	15' bgs
Sample Date	5/21/2019
Parameter / Units	ug/m3
1,3-Butadiene	6
Acetone	1100
Methyl Ethyl Ketone	54
n-Hexane	40
Tetrachloroethene	20
Trichlorofluoromethane	13

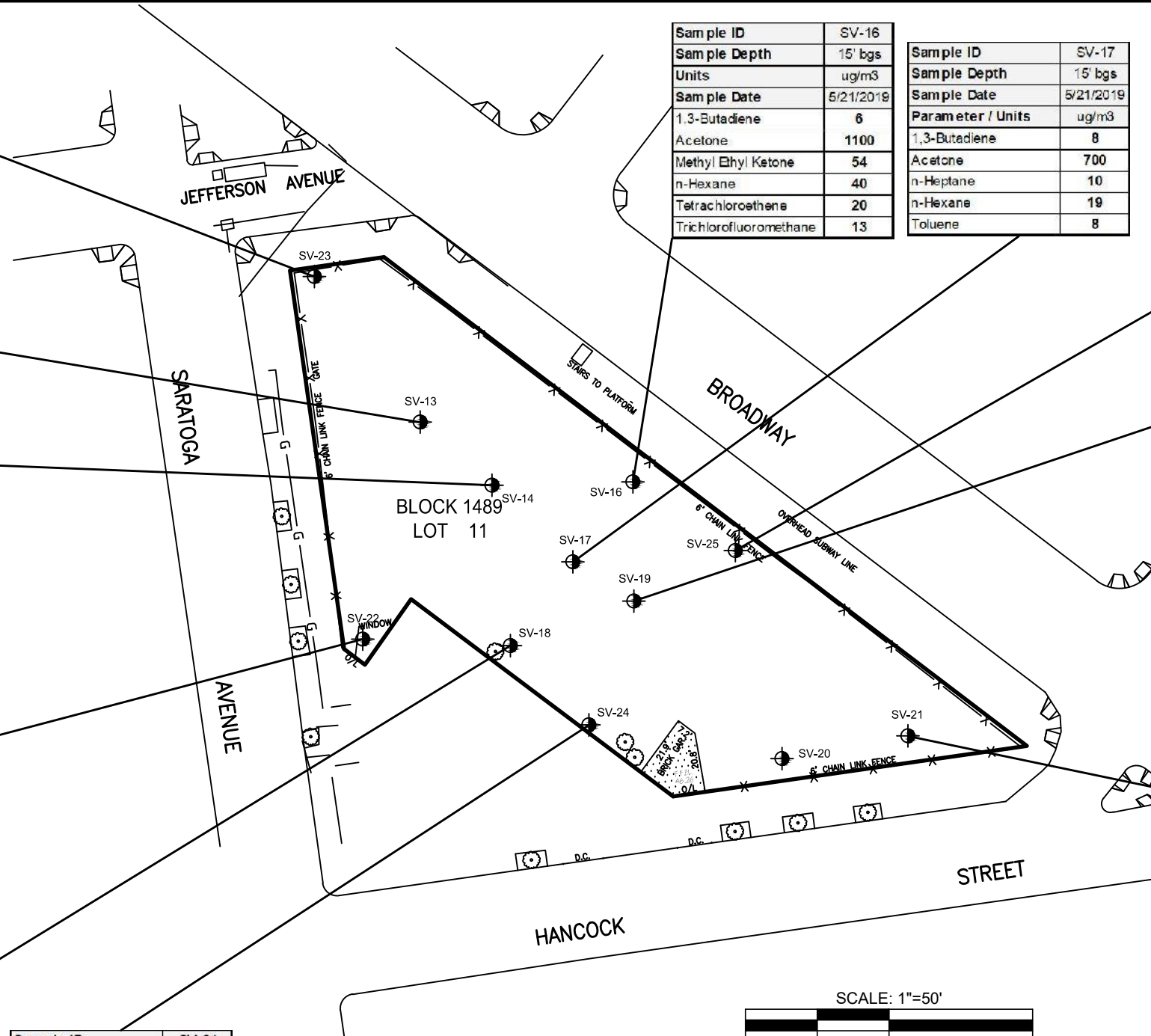
Sample ID	SV-17
Sample Depth	15' bgs
Sample Date	5/21/2019
Parameter / Units	ug/m3
1,3-Butadiene	8
Acetone	700
n-Heptane	10
n-Hexane	19
Toluene	8

Sample ID	SV-25
Sample Depth	15' bgs
Sample Date	5/21/2019
Parameter / Units	ug/m3
1,3-Butadiene	16
Acetone	1500
Benzene	10
Methyl Ethyl Ketone	110
n-Heptane	17
n-Hexane	28
Tetrachloroethene	14
Toluene	9
Trichlorofluoromethane	25

Sample ID	SV-19
Sample Depth	15' bgs
Sample Date	5/21/2019
Parameter / Units	ug/m3
1,3-Butadiene	35
Acetone	1500
Benzene	8
Carbon disulfide	19
Methyl Ethyl Ketone	70
n-Heptane	76
n-Hexane	120
Toluene	52
Trichloroethene	400
Trichlorofluoromethane	50

Sample ID	SV-21
Sample Depth	15' bgs
Sample Date	5/21/2019
Parameter / Units	ug/m3
1,3-Butadiene	20
Acetone	990
Benzene	12
Chloroform	29
Methyl Ethyl Ketone	51
n-Heptane	9
n-Hexane	16
Tetrachloroethene	15
Toluene	10

Sample ID	AMBIENT
Sample Depth	Grade
Sample Date	5/21/2019
Parameter / Units	ug/m3
Chloromethane	1



NOTES:

1. ANALYTES NOT SHOWN ON THIS FIGURE WERE NOT DETECTED IN SOIL VAPOR SAMPLE COLLECTED DURING THIS REMEDIAL INVESTIGATION.
2. ug/m3 = MICROGRAMS PER METER CUBED

LEGEND

- PROJECT SITE BOUNDARY
- SV-20 SOIL VAPOR LOCATION
- x-x- FENCE

dwg by: yy
chk by: FD
scale: AS NOTED
date: 07/24/2020

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project: 1510 BROADWAY
DRY CLEANERS SITE
BROOKLYN, NEW YORK

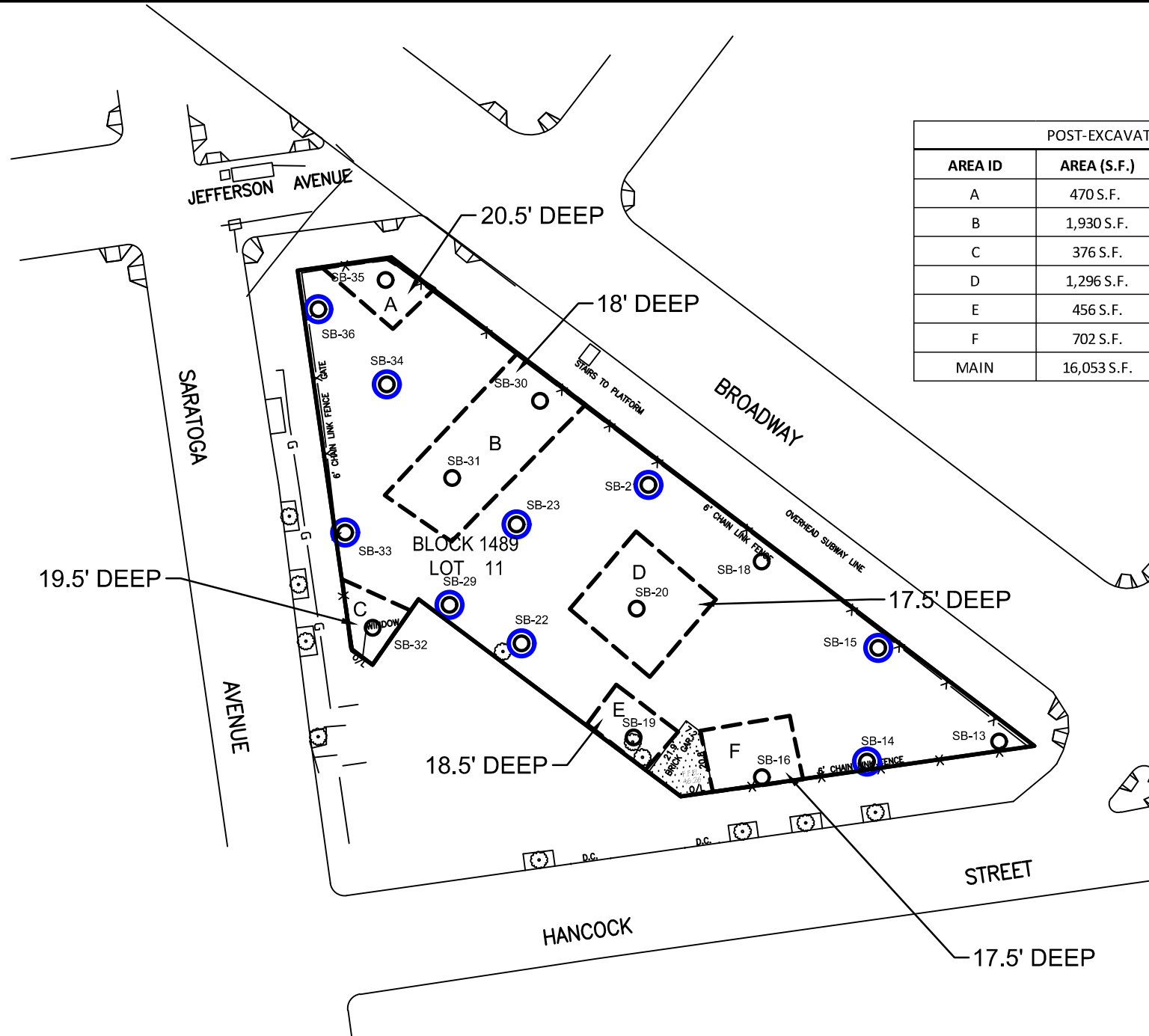
drawing title: SOIL VAPOR SAMPLE
RESULTS PLAN

job no: 9753
drawing no:

FIG-2.5

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N:\ACAD\9753\RAWP\9753 - FIG-5.1 EXCAVATION PLAN 3.DWG 08/21/20 09:42:03AM, aas, LAYOUT:FIG-5.1



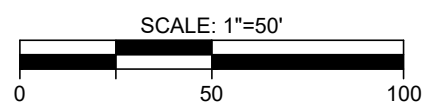
POST-EXCAVATION CONFIRMATIONS SAMPLES			
AREA ID	AREA (S.F.)	BOTTOM SAMPLES	SIDEWALL SAMPLES
A	470 S.F.	1	2
B	1,930 S.F.	3	5
C	376 S.F.	1	1
D	1,296 S.F.	2	4
E	456 S.F.	1	3
F	702 S.F.	1	3
MAIN	16,053 S.F.	17	N/A

LEGEND

- PROJECT SITE BOUNDARY
- SOIL BORING LOCATION
- FENCE
- VERTICAL DELINEATION ACHIEVED
SAMPLE DEPTHS PROVIDED IN TABLE 1 AND TABLE 2A - TABLE 2F
- EXCAVATION AREAS

NOTE:
SITE WIDE EXCAVATION SHALL BE TO 15' BELOW GROUND SURFACE

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dwg by: yy
chk by: FD
scale: AS NOTED
date: 08/21/2020

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project:
1510 BROADWAY
DRY CLEANERS SITE
BROOKLYN, NEW YORK

drawing title:
EXCAVATION PLAN

job no: 9753
drawing no:

FIG-5.1

APPENDIX A
CITIZENS PARTICIPATION PLAN



Department of
Environmental
Conservation

Brownfield Cleanup Program

Citizen Participation Plan for 1510 Broadway Dry Cleaner Site

November 2018

C224280
1510 Broadway
Brooklyn, NY 11221

Contents

<u>Section</u>	<u>Page Number</u>
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2. Citizen Participation Activities.....	3
3. Major Issues of Public Concern.....	9
4. Site Information.....	9
5. Investigation and Cleanup Process	9
Appendix A - Project Contacts and Locations of Reports and Information	13
Appendix B - Site Contact List.....	14
Appendix C - Site Location Map.....	20
Appendix D - Brownfield Cleanup Program Process	21

* * * * *

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: **1510 Broadway LLC c/o The Macquesten Companies (“Applicant”)**
Site Name: **1510 Broadway Dry Cleaner Site (“Site”)**
Site Address: **1510 Broadway**
Site County: **Kings County**
Site Number: **C224280**

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.

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, the significant threat determination for the site had not yet been made.

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. Forty-five 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.

There will be areas on the Site where soil excavation is necessary. Therefore, once the remediation commences, there may be concerns regarding odors, noise or truck traffic coming from the Site. However, these impacts will be mitigated through implementation of a Health and Safety Plan and Soil Management Plan approved by the Department, which will be designed to minimize these impacts. A Community Air Monitoring Plan will also be implemented to monitor dust and vapors to ensure the community is not impacted.

The Site is located in an Environmental Justice Area. Environmental justice is defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Environmental justice efforts focus on improving the environment in communities, specifically minority and low-income communities, and addressing disproportionate adverse environmental impacts that may exist in those communities.

The Site is located in an area with a sizable African-American population. There is no need to translate future fact sheets into another language.

For additional information, visit:

<https://statisticalatlas.com/tract/New-York/Kings-County/037500/Race-and-Ethnicity>

4. Site Information

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

Site Description

- **location – 1510 Broadway, Brooklyn, NY (Tax Block 1489, Lots 6, 11, 12, 13, 14, 15, 16, 17, and 18)**
- **setting – urban, suburban**
- **site size – 0.4605 acres**
- **adjacent properties – residential, commercial**

History of Site Use, Investigation, and Cleanup

Historical Sanborn maps indicated the property was developed with four three-story buildings used as offices and storefronts by 1888. Nine additional four-story commercial buildings were developed by 1908 and by 1932, two additional buildings occupied the site. The property had the following former industrial and commercial uses that are likely to have contributed to contamination: dry cleaners, dress manufacturer/dyeing facility, printer, and watch and jewelry repair. The address may have changed over time and the following uses were either on the property or immediately adjacent to it: a paint and oils store at 1522 Broadway on a 1932 map, a dry cleaner at 7 Saratoga Avenue from approximately 1949 to 1965, a cleaning and dyeing facility at 1520 Broadway in 1928, a dress house/dress manufacturer at 1520 Broadway in 1934, a printer at 1516 Broadway in 1934, and watch and jewelry repair at 1510 Broadway in 1949. Industrial, automotive, and dry-cleaning uses were also noted in the surrounding area including garages with gasoline tanks to the south/west, substations to the south- and northwest, a chemical and bleach bottling facility to the northwest, a paint manufacturer, and a dry cleaner approximately 250 feet south-southwest of the Site.

These historic uses have contributed to the on-Site contamination. Perchloroethylene (more commonly known as PCE or PERC) is a cleaning product used by dry cleaners, which is present in groundwater and soil vapor, and which likely resulted from on-Site dry-cleaning operation. Petroleum related compounds are also present, which likely result from the former on-Site garages. The Site soils also consist of contaminated historic fill brought to the Site from other locations to level the ground surface, which was a common historic practice.

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 its Application proposes that the site will be used for residential purposes. It is not yet known if unrestricted or restricted residential use standards will be achieved subsequent to the remediation.

To achieve either of these residential cleanup goals, the Applicant will conduct investigation and 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.

Investigation

The Applicant will conduct an investigation of the site officially called a “remedial investigation” (RI). This investigation will be performed with NYSDEC oversight. The Applicant must develop a remedial investigation workplan, which is subject to public comment.

The site investigation has several goals:

- 1) Define the nature and extent of contamination in soil, surface water, groundwater and any other parts of the environment that may be affected;
- 2) Identify the source(s) of the contamination;
- 3) Assess the impact of the contamination on public health and the environment; and
- 4) Provide information to support the development of a proposed remedy to address the contamination or the determination that cleanup is not necessary.

The Applicant submits a draft “Remedial Investigation Work Plan” to NYSDEC for review and approval. NYSDEC makes the draft plan available to the public review during a 30-day public comment period.

When the investigation is complete, the Applicant will prepare and submit a report that summarizes the results. This report also will recommend whether cleanup action is needed to address site-related contamination. The investigation report is subject to review and approval by NYSDEC.

NYSDEC will use the information in the investigation report to determine if the site poses a significant threat to public health or the environment. If the site is a “significant threat,” it must be cleaned up using a remedy selected by NYSDEC from an analysis of alternatives prepared by the Applicant and approved by NYSDEC. If the site does not pose a significant threat, the Applicant may select the remedy from the approved analysis of alternatives.

Interim Remedial Measures

An Interim Remedial Measure (IRM) is an action that can be undertaken at a site when a source of contamination or exposure pathway can be effectively addressed before the site investigation and analysis of alternatives are completed. If an IRM is likely to

represent all or a significant part of the final remedy, NYSDEC will require a 30-day public comment period.

Remedy Selection

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

1. 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

2. 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 (FER) 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 FER. 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.

An *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):

Sarah Quandt
Project Manager
NYSDEC
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, NY 12233
Tel: 518-402-9767
Email: Sarah.quandt@dec.ny.gov

Thomas V. Panzone
Public Participation Specialist
NYSDEC Region 2
Division of Environmental Remediation
1 Hunter’s Point Plaza – 1st Floor
47-40 21st Street
Long Island City, NY 11101
Tel: 718-482-4953
Email: Thomas.panzone@dec.ny.gov

New York State Department of Health (NYSDOH):

Justin Deming
NYSDOH
Bureau of Environmental Exposure
Investigation
Empire State Plaza
Corning Tower Room 1787
Albany, NY 12237
Tel: 518-402-7860
Email: BEEI@health.ny.gov

Locations of Reports and Information

The facilities identified below are being used to provide the public with convenient access to important project documents:

Brooklyn Public Library The Saratoga Branch 8 Thomas S. Boyland Street Attn: Linda Johnson Phone: 718-230-2100	Brooklyn Community Board No. 16 Attn: Genese T. Morgan, Chairman Viola Greene-Walker, District Manager Ms. Balinda Harris – Environmental Committee
--	---

Hours: Mon-Thurs 9am-9pm Fri-Sat 9am-6pm Sunday 1pm-5pm	444 Thomas Boyland Street, Rm. 103 Brooklyn, NY 11212 Phone: 718-385-0323 Hours: Call for hours
---	--

Appendix B - Site Contact List

Federal Government Officials	
Hon Charles Schumer U.S. Senate 780 Third Avenue, Suite 2301 New York, NY 10017	Hon. Kristen Gillibrand U.S. Senate 780 Third Avenue, Suite 2601 New York, NY 10017
Local Government Officials	
Hon. Hakeem Jeffries U.S. House of Representatives 55 Hanson Place, Suite 603 Brooklyn, NY 11217	Hon. Martin Malave Dilan New York State Senate 3215 Fulton Street Brooklyn, NY 11208
Nancy T. Sunshine Kings County Clerk 360 Adams Street, Room 189 Brooklyn, NY 11201	Hon. Eric Adams Kings County Executive (Borough President) Borough Hall 209 Joralemon Street Brooklyn, NY 11201
Marisa Lago Commissioner, NYC Dept. of City Planning 120 Broadway, 31st Floor New York, NY 10271	Hon. Bill de Blasio Mayor of New York City City Hall New York, NY 10007
Andrea Hagelgans Strategic Planning Advisor, New York City City Hall New York, NY 10007	Hon. Scott Stringer NYC Comptroller 1 Centre Street New York, NY 10007
Hon. Latrice Monique Walker	

NYS Assemblywoman 400 Rockaway Avenue, 2 nd Floor Brooklyn, NY 11212	
Hon. Letitia James Public Advocate 1 Centre Street New York, NY 10007	Mark McIntyre, Director NYC Office of Environmental Remediation 100 Gold Street - 2nd Floor New York, NY 10038
Julie Stein Office of Environmental Assessment & Planning NYC Dept. of Environmental Protection 96-05 Horace Harding Expressway Flushing, NY 11373	Hon. Alicka Ampry-Samuel NYC Councilwoman 400 Rockaway Avenue Brooklyn, NY 11212
Public Water Supply	
Vincent Sapienza New York City Public Water Supply System Department Commissioner 59-17 Junction Blvd. Flushing, NY 11373	Alfonso Carney Chair of New York City Water Board 59-17 Junction Blvd., 8th Floor Flushing, NY 11373
Local News Media	
David Kirschner Brooklyn Media Outlet - News 12 1 Media Crossways Woodbury, NY 11791	Park Slope Courier Media Outlet 1 Metrotech Center North Brooklyn, NY 11201
Spectrum NY 1 News 75 Ninth Avenue New York, NY 10011	Brooklyn Daily Eagle 16 Court Street, Suite 1208 Brooklyn, NY 11241
New York Post 1211 Avenue of the Americas New York, NY 10036	New York Daily News 4 New York Plaza New York, NY 10004
Courier-Life Publications 1 Metro-Tech Center North - 10th Floor Brooklyn, NY 11201	The Brooklyn Papers 1 Metrotech Center, Suite 1001 Brooklyn, NY 11201
Schools and Day Care Facilities	
April Davis Director, Brightside Academy Early Education and Child Care	Traditional Educational Center 1469 BROADWAY Brooklyn, NY 11221

1491 Broadway Brooklyn, NY 11221	
HCHC INC. 1441 Broadway Brooklyn, NY 11221	Little Angels Day Care 1068 Putnam Ave Brooklyn, NY 11221
Hancock Group Family Daycare Inc 868 Hancock St Brooklyn, NY 11233	Brooklyn High School for Law & Technology 1396 Broadway Brooklyn, NY 11221
Adjacent Property Owners	
NYC Housing Preservation & Dev. Adj. Property Owner of 1531 Broadway 100 Gold Street New York, NY 10038	Intra-Brokerage Association Against Points, Inc. Adj. Property Owner of 1517 Broadway 2314 Pitkin Avenue Brooklyn, NY 11202
1533 Realty, L.L.C. Adj. Property Owner of 1533 Broadway C/O Rita Woldenberg, et al Sacks Press & Lacher PC 600 3rd Avenue, 18th Floor New York, NY 10016	Key Food Adj. Operator of 1533 Broadway 1533 Broadway Brooklyn, NY 11221
Rebuilt Realty Corp. Adj. Property Owner of 1534 Broadway 57-52 49th Place Maspeth, NY 11378	Broadway Medical Center Adj. Operator of 1534 Broadway 1534 Broadway Brooklyn, NY 11221
Kings Realty & Properties LLC Adj. Property Owner of 956 Hancock Street 543 Bedford Avenue # 194 Brooklyn, NY 11211	Kraus Farm Vintage Adj. Operator of 956 Hancock Street 956 Hancock Street Brooklyn, NY 11233
NYC Housing Authority Adj. Property Owner of 946 Hancock Street 250 Broadway, 9th floor New York, NY 10038	Saratoga Village Community Center Adj. Operator of 940 Hancock Street 940 Hancock Street Brooklyn, NY 11233
Beauty Plus Beauty Supply Store Broadway Adj. Operator of 901-925 Halsey Street 901-925 Halsey Street Brooklyn, NY 11233	NYC Housing Authority Adj. Property Owner of 33 Saratoga Avenue 250 Broadway, 9th floor New York, NY 10038
Anthony Brown Adj. Property Owner of 932 Hancock Street	Maria and Allyson Serrano Adj. Property Owner of 937 Hancock Street

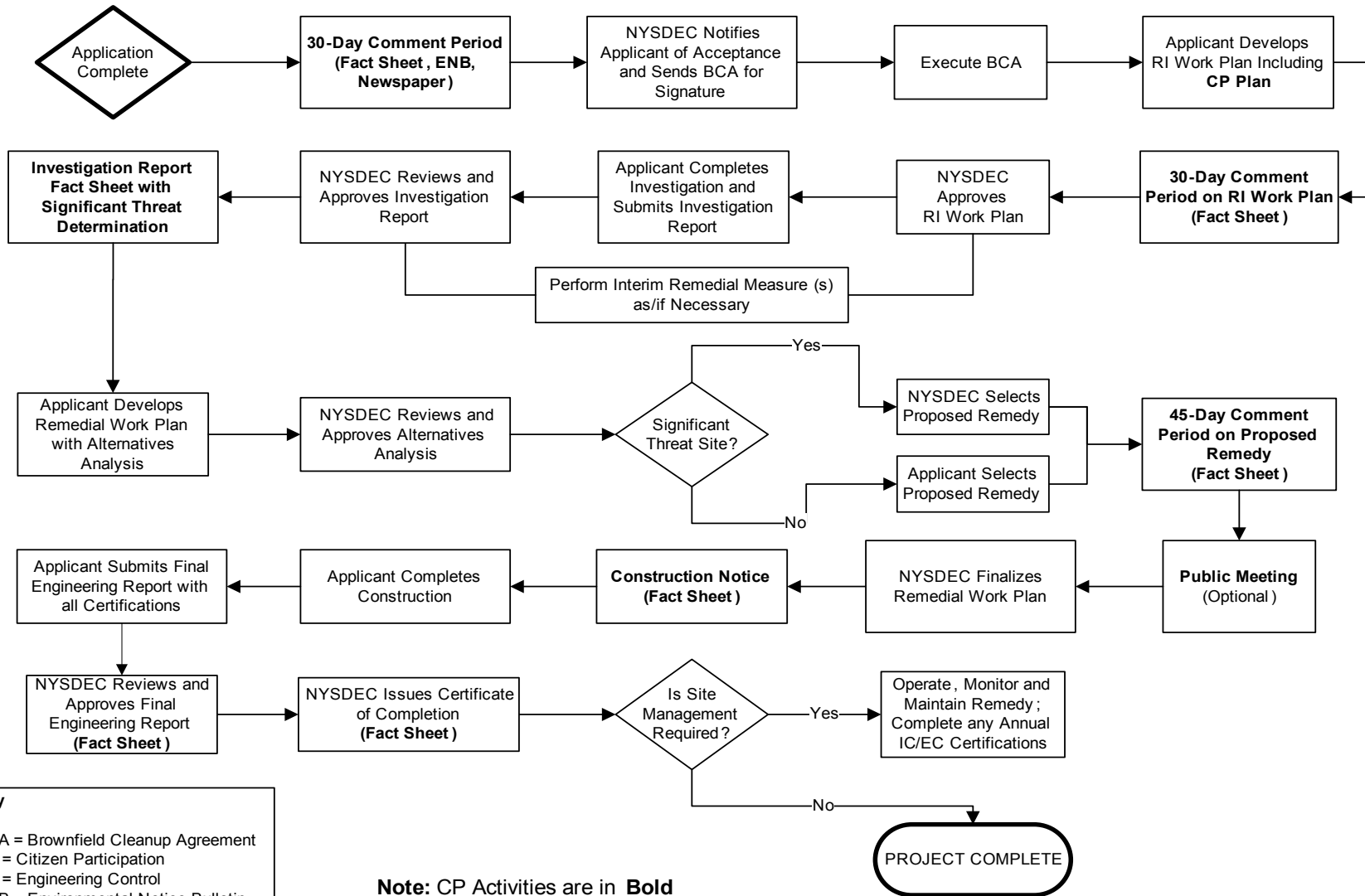
932 Hancock Street Brooklyn, NY 11233	937 Hancock Street Brooklyn, NY 11233
Top Cats Barbershop Adj. Operator of 14 Saratoga Avenue 14 Saratoga Avenue Brooklyn, NY 11233	Tong Quan Wong Adj. Property Owner of 992 Jefferson Avenue 992 Jefferson Avenue Brooklyn, NY 11221
Bravo Gourmet Deli Adj. Operator of 10 Saratoga Avenue 10 Saratoga Avenue Brooklyn, NY 11233	NYC Housing Authority Adj. Property Owner of 1019-947 Jefferson Avenue 250 Broadway, 9th floor New York, NY 10038
NYC Transit Authority Adj. Operator of 1019-947 Jefferson Avenue 2 Broadway New York, NY 10004	Broadway Bushwick Builders, L.P. Adj. Property Owner of 1485 Broadway 515 Madison Avenue Floor 22 New York, NY 10022
1487 Broadway LLC Adj. Property Owner of 1487 Broadway 1274 49th Street, Suite 443 Brooklyn, NY 11219	City Bear Coffee & Wine Adj. Operator of 1487 Broadway 1487 Broadway Brooklyn, NY 11211
JSB Realty Associates LLC Adj. Property Owner of 1491 Broadway 15 Ocean Avenue Brooklyn, NY 11225	Brightside Academy Adj Operator of 1491 Broadway 1491 Broadway Brooklyn, NY 11221
Little Caesar's Pizza Adj. Operator of 1491 Broadway 1491 Broadway Brooklyn, NY 11221	Kim Corrado Adj. Property Owner of 1499 Broadway 1499 Broadway Brooklyn, NY 11221
Naziemul Safi Adjacent Property Owner of 17 Saratoga Avenue 17 Saratoga Avenue Brooklyn, NY 11233	
Community, Civic, Religious and Other Environmental Organizations	
Saratoga Square NC 930 Halsey Street Brooklyn, NY 11233	Saratoga Avenue Community Center 940 Hancock St Brooklyn, NY 11233
Antonia Yuille - Director Consolidated Edison Corporate Affairs 30 Flatbush Avenue Brooklyn, NY 11217	Anthony Newerls - President 73rd Police Precinct Council 1470 East New York Brooklyn, NY 11212
Ladder 116 FDNY	New York City Housing Authority's Saratoga Square

37-20 29 STREET Long Island City, NY 11101	55 Saratoga Ave Brooklyn, NY 11233
New York City Housing Authority 930 Halsey St Brooklyn, NY 11233	Church of God of Prophecy 1243 Bushwick Ave Brooklyn, NY 11221
First Calvary Baptist Church 953 Putnam Ave Brooklyn, NY 11221	The Salvation Army Brooklyn Bushwick Corps Community Center 1151 Bushwick Ave Brooklyn, NY 11221

**Appendix C- Site Location
Map**



Appendix D– Brownfield Cleanup Program Process



Key
 BCA = Brownfield Cleanup Agreement
 CP = Citizen Participation
 EC = Engineering Control
 ENB = Environmental Notice Bulletin
 IC = Institutional Control
 RI = Remedial Investigation

Note: CP Activities are in **Bold**

APPENDIX B
HEALTH AND SAFETY PLAN



SITE-SPECIFIC HEALTH AND SAFETY PLAN

**1510 Broadway, LLC
Site #C224280**

**1510 Broadway Dry Cleaner Site
Brooklyn, New York**

Prepared For:

**1510 Broadway LLC c/o The MacQuesten Companies
438 Fifth Avenue Suite 100
Pelham, New York 10803**

Prepared By:

**SESI CONSULTING ENGINEERS
12A Maple Avenue
Pine Brook, NJ 07058**

Project No.: 09753

July 2020

Disclaimer: This Health and Safety Plan (HASP) is based upon information provided [and, if applicable, conditions discovered during a site visit], and is limited by the project scope.

The HASP should be periodically reviewed and updated based on a number of factors, including but not limited to: (1) changes in applicable governmental requirements; (2) changes in procedures at the site; and (3) site conditions which were unknown to SESI Consulting Engineers (SESI) as of the time the HASP was prepared.

This HASP has been prepared for the sole and exclusive use of 1510 Broadway LLC c/o The Macquesten Companies, and may not be relied upon by any other person without the express written consent and authorization of SESI.

SITE-SPECIFIC HEALTH AND SAFETY PLAN

For

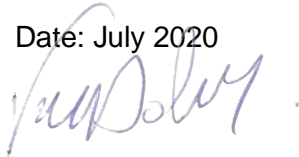
**1510 Broadway, LLC
Site #C224280
1510 Broadway Dry Cleaner Site
Brooklyn, New York**

Prepared by: Date: July 2020



Todd Kelly
SESI- Assistant Project Manager

Approved by: Date: July 2020



Fuad Dahan
SESI-Principal

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LIST OF ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
COC	Constituent(s) of Concern
CRZ	Contamination Reduction Zone
EZ	Exclusion Zone
FS	Field Supervisor
GFCI	Ground Fault Circuit Interrupter
HASP	Health and Safety Plan
HSM	Health and Safety Manager
LEL	Lower Explosive Limit
MSDS	Material Safety Data Sheet
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyls
PEL	Permissible Exposure Limit
PID	Photoionization Detector
PM	Project Manager
PO	Project Officer
PPE	Personal Protective Equipment
SESI	SESI Consulting Engineers
SSO	Site Safety Officer
SVOC	Semi-Volatile Organic Compound
SZ	Support Zone
TLV	Threshold Limit Value
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

HEALTH AND SAFETY PLAN SUMMARY

The chemical hazards associated with site operations are related to inhalation, ingestion, and skin exposure to site Chemicals of Concern (COCs). COCs at the site include metals, some VOC compounds, some SVOC compounds and some pesticides. Concentrations of airborne COCs during site tasks may be measurable and will require air monitoring during certain operations.

The potential for inhalation of site COCs is low. The potential for dermal contact with soils containing site COCs during remedial operations is moderate.

The following table summarizes airborne contaminant action levels that will be used to determine the procedures and protective equipment necessary based on conditions as measured at the site.

Parameter	Reading	Action
Dust	0 to .5 mg/m ³	Normal operations
	0.5 to 1 mg/m ³	Begin soil wetting procedure (Level C protection would be needed beyond this point)
	> 1 mg/m ³	Stop work, fully implement dust control plan
Oxygen	≤ 19.5%	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
	> 19.5% to < 23.5%	Normal operations
	≥ 23.5%	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
Carbon Monoxide	0 ppm to ≤ 20 ppm	Normal operations
	> 20 ppm	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area

The level of personal protection selected will be based on air monitoring of the work environment and an assessment by the Field Supervisor and Site Safety Officer. The following table presents a selection matrix to determine appropriate Personal Protective Equipment.

Task	Anticipated Level of Protection
Mobilization	Level D
Subsurface Intrusive Activities (Mass Excavation, Drilling, Soil Grouting)	Modified Level D/Level C
Earthwork/Grading	Level D
Additional Chemical Sampling / Delineation	Modified Level D/Level C
Decontamination	Modified Level D
Demobilization	Level D

1.0 INTRODUCTION

1.1 Objective

The objective of this Health and Safety Plan (HASP) is to provide a mechanism for establishing safe working conditions during activities at the Broadway Dry Cleaner Site (BCP#C224280) ("Site"), 1510 Broadway LLC, Brooklyn, New York (the Site). The safety organization, procedures, and protective equipment have been established based on an analysis of potential physical, chemical, and biological hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of injury, illness, or other hazardous incident.

The HASP was written to meet the requirements of all applicable Federal, State, and local health and safety regulations, including 29 CFR 1910.120. The HASP is based on current knowledge regarding the specific chemical and physical hazards that are known or anticipated at the Site. This HASP is a dynamic document, for which changes and/or revisions may be realized as changes in scope and/or site conditions are encountered. Should revised documents be produced, said revised documents will refer to the specific changes and why they were made.

1.2 Site and Facility Description

The Site comprises 0.4605-acres. The Site property is identified on the city tax map as Block 1489, Lot 11 and is located at 1510 Broadway in the Bedford-Stuyvesant / Brownsville section of Brooklyn, New York. The Site is located in an area of primarily mixed commercial and residential uses. The Site and nearby properties are generally level. The Site previously consisted of nine (9) lots (6, 11, 12, 13, 14, 15, 16, 17, 18) and was historically identified as 7 Saratoga Avenue and 1510-1524 Broadway.

The Site is bounded to the north by Jefferson Avenue beyond which lies transit system sub-station; to the south by an apparent vacant building and Hancock Street, beyond which lies a medical center and residential properties; to the east by Broadway and an elevated subway (J and Z line) tracks, beyond which lies commercial properties; and to the west by the Saratoga Avenue, beyond which lies residential properties.

1.3 Policy Statement

The policy of SESI Consulting Engineers (SESI) is to provide a safe and healthful work environment. No aspect of operations is of greater importance than injury and illness prevention. A fundamental principle of safety management is that all injuries, illnesses, and incidents are preventable. SESI will take every reasonable step to eliminate or control hazards in order to minimize the possibility of injury, illness, or incident.

This HASP prescribes the procedures that must be followed by SESI personnel during activities at the site. Operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager (PM) and the Health and Safety Manager (HSM). This document will be reviewed periodically by the HSM to ensure that it is current and technically correct. Any changes in site conditions and/or the scope of work will require a review and modification to this HASP. Such changes will be completed in the form of an addendum or a revision to the plan.

The provisions of this plan are mandatory for all SESI personnel and are advisory for all contractors, and subcontractors assigned to the project. ***Subcontractors will be responsible for preparing their own site-specific HASPs that meet the basic***

requirements outlined in this HASP. All visitors to SESI work areas at the site must abide by the requirements of this plan.

1.4 References

This HASP complies with applicable Occupational Safety and Health Administration (OSHA) regulations, United States Environmental Protection Agency (USEPA) regulations, and SESI health and safety policies and procedures. This plan follows the guidelines established in the following:

- *Standard Operating Safety Guides*, USEPA (Publication 9285.1-03, June 1992).
- *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH, OSHA, USCG, USEPA (86116, October 1985).
- *Title 29 of the Code of Federal Regulations (CFR), Part 1910.*
- *Title 29 of the Code of Federal Regulations (CFR), Part 1926.*
- *Pocket Guide to Chemical Hazards*, DHHS, PHS, CDC, NIOSH (2004).
- *Threshold Limit Values*, ACGIH (2005).
- *Guide to Occupational Exposure Values*, ACGIH (2005).
- *Quick Selection Guide to Chemical Protective Clothing*, Forsberg, K. and S.Z. Mansdorf, 2nd Ed. (1993).

1.5 Definitions

The following definitions (listed alphabetically) are applicable to this HASP:

- *Contamination Reduction Zone (CRZ)* - Area between the exclusion zone and support zone that provides a transition between contaminated and clean areas. Decontamination stations are located in this zone.
- *Exclusion Zone (EZ)* - Any portions of the site where hazardous substances are, or are reasonably suspected to be present, and pose an exposure hazard to on-site personnel.
- *Incident* - All losses, including first aid cases, injuries, illnesses, spills/leaks, equipment and property damage, motor vehicle accidents, regulatory violations, fires, and business interruptions.
- *On-Site Personnel* - All SESI and subcontractors involved with the project.
- *Project* - All on-site work performed under the scope of work.
- *Site* - The area described in Section 1.2, Site and Facility Description, where the work is to be performed by SESI personnel and subcontractors.
- *Support Zone (SZ)* - All areas of the site except the EZ and CRZ. The SZ surrounds the CRZ and EZ. Support equipment and break areas are located in this zone.
- *Subcontractor* - Includes contractor personnel hired by SESI.
- *Visitor* - All other personnel, except the on-site personnel.
- *Work Area* - The portion of the site where work activities are actively being performed. This area may change daily as work progresses and includes the SZ,

CRZ, and EZ. If the work area is located in an area on the site that is not contaminated, or suspected of being contaminated, the entire work area may be a SZ.

2.0 PROJECT SCOPE OF WORK

This HASP contains information for the following tasks that SESI is anticipated to conduct at the Site. Should additional and/or different tasks be identified, amendments to this HASP will be required to address these changed items.

- Monitoring activities for groundwater;
- Soil Borings and Soil sampling;
- Sub slab installation and monitoring;
- Excavation of contaminated soil “hot spots”;
- Earthwork and grading;
- Decontamination and demobilization/site restoration.

3.0 ROLES AND RESPONSIBILITIES

3.1 All Personnel

All SESI project personnel must adhere to the procedures outlined in this HASP during the performance of their work. Each person is responsible for completing tasks safely and reporting any unsafe acts or conditions to their supervisor. No person may work in a manner that conflicts with these procedures. After due warnings, the PM will dismiss from the site any SESI employee or subcontractor who violates safety procedures.

All SESI project personnel will receive training in accordance with applicable regulations and be familiar with the requirements and procedures contained in this HASP prior to initiating site activities. In addition, all SESI personnel will attend an initial hazard briefing prior to beginning work at the site.

The roles of key safety personnel and subcontractors are outlined in the following sections. Key project personnel and contacts are summarized in Table 1 in Section 3.6.

3.2 Key Safety Personnel

3.2.1 Project Officer (PO)

The PO is responsible for providing resources to assure project activities are completed in accordance with this HASP, and for meeting all regulatory and contractual requirements.

3.2.2 Project Manager (PM)

The PM is responsible for verifying that project activities are completed in accordance with the requirements of this HASP. The PM is responsible for confirming that the Field Supervisor (FS) has the equipment, materials, and qualified personnel to fully implement the safety requirements of this HASP, and/or that subcontractors assigned to this project meet the requirements established by SESI. It is also the responsibility of the PM to:

- Consult with the HSM on site health and safety issues;
- Verify that subcontractors meet health and safety requirements prior to commencing work;
- Verify that all incidents are thoroughly investigated;

- Approve, in writing, addenda or modifications of this HASP; and
- Suspend work or modify work practices, as necessary, for personal safety, protection of property, and regulatory compliance.

3.2.3 Health and Safety Manager (HSM)

The HSM or his designee, the health and safety manager (HSM), has overall responsibility for the technical health and safety aspects of the project, including review and approval of this HASP. Inquiries regarding health and safety procedures, project procedures, and other technical or regulatory issues should be addressed to this individual. The HSM or his designee must approve changes or addenda to this HASP.

3.2.4 Site Safety Officer (SSO)

The SSO is responsible for field health and safety issues, including the execution of this HASP. Questions in the field regarding health and safety procedures, project procedures, and other technical or regulatory issues should be addressed to this individual. The SSO will advise the PM on health and safety issues and will establish and coordinate the project air-monitoring program if one is deemed necessary (see Section 5.1, Air Monitoring). The SSO is the primary site contact on health and safety matters. It is the responsibility of the SSO to:

- Provide on-site technical assistance, if necessary;
- Participate in all accident/incident reports and ensure that they are reported to the HSM, client, and PM within 24 hours;
- Coordinate site and personal air monitoring as required, including equipment maintenance and calibration;
- Conduct site safety orientation training and safety meetings;
- Verify that project personnel have received the required physical examinations and medical certifications;
- Review site activities with respect to compliance with this HASP;
- Maintain required health and safety documents and records; and
- Assist the FS in instructing field personnel on project hazards and protective procedures.

3.2.5 Field Supervisor (FS)

The FS is responsible for implementing this HASP, including communicating requirements to on-site personnel and subcontractors. The FS will be responsible for informing the PM of changes in the work plan, procedures, or site conditions so that those changes may be addressed in this HASP. Other responsibilities are to:

- Consult with the SSO on site health and safety issues;
- Stop work, as necessary, for personal safety, protection of property, and regulatory compliance;
- Obtain a site map and determine and post routes to medical facilities and emergency telephone numbers;
- Notify local public emergency representatives (as appropriate) of the nature of the site operations, and post their telephone numbers (i.e., local fire department personnel who would respond for a confined space rescue);
- Observe on-site project personnel for signs of ill health effects;
- Investigate and report any incidents to the SSO;

- Verify that all on-site personnel have had applicable training;
- Verify that on-site personnel are informed of the physical, chemical, and biological hazards associated with the site activities, and the procedures and protective equipment necessary to control the hazards; and
- Issue/obtain any required work permits (hot work, confined space, etc.).

3.2.6 Field Personnel (FP)

All SESI field personnel are responsible for following the Health and Safety procedures specified in this HASP and work practices specified in applicable operation procedures. Some specific responsibilities include, but are not limited to:

- Reading and understanding the HASP;
- Reporting all accidents, incidents, injuries, or illnesses to the FS;
- Complying with the requests of the SSO;
- Immediately communicating newly identified hazards or noncompliance issues to the FS or SSO; and
- Stopping work in cases of immediate danger.

3.3 Subcontractors

Subcontractors and their personnel must understand and comply with applicable regulations and site requirements established in this HASP. Subcontractors will prepare their own site-specific HASP that must be consistent with the requirements of this HASP.

All subcontractor personnel will receive training in accordance with applicable regulations and be familiar with the requirements and procedures contained in this HASP prior to initiating site activities. All subcontractor personnel will attend an initial hazard briefing prior to beginning work at the site. Additionally, on-site subcontractor personnel must conduct daily site safety meetings.

Subcontractors must designate individuals to function as the PM, HSM, SSO, and FS. In some firms the HSM to be carried out by the PM. This is acceptable provided the PM has the required knowledge, training, and experience to properly address all hazards associated with the work, and to prepare, approve, and oversee the execution of the site-specific HASP. A subcontractor may designate the same person to perform the duties of both the SSO and the FS. However, depending on the level of complexity of a contractor's scope of work, it may be infeasible for one person to perform both functions satisfactorily.

3.4 Stop Work Authority

Every SESI employee and subcontractor is empowered, expected, and has the responsibility to stop the work of another co-worker if the working conditions or behaviors are considered unsafe.

3.5 All On-Site Personnel

All on-site SESI personnel (including SESI subcontractors) must read and acknowledge their understanding of their respective HASPs before commencing work and abide by the requirements of the plans. All on-site SESI personnel shall sign their HASP Acknowledgement Form following their review of their HASP.

All SESI project personnel will receive training in accordance with applicable regulations and be familiar with the requirements and procedures contained in this HASP prior to initiating site activities. In addition, all on-site personnel will attend an initial hazard briefing provided by the SSO prior to beginning work at the site and conduct daily safety meetings thereafter.

On-site personnel will immediately report the following to the FS or SSO:

- Personal injuries and illnesses no matter how minor;
- Unexpected or uncontrolled release of chemical substances;
- Symptoms of chemical exposure;
- Unsafe or hazardous situations;
- Unsafe or malfunctioning equipment;
- Changes in site conditions that may affect the health and safety of project personnel;
- Damage to equipment or property; and
- Situations or activities for which they are not properly trained.

3.6 Visitors

All SESI personnel and subcontractors visiting the Site must check in with the FS. Visitors will be cautioned to avoid skin contact with surfaces, soils, groundwater, or other materials that may impacted or be suspected to be impacted by constituents of concern (COCs).

Visitors requesting to observe work at the site must don appropriate personal protective equipment (PPE) prior to entry to the work area and must have the appropriate training and medical clearances to do so. If respiratory protective devices are necessary, visitors who wish to enter the work area must have been respirator-trained and fit tested for a respirator within the past 12 months.

Table 1 – Key Safety Personnel

SESI Personnel		
Role	Name	Address/Telephone No.
Project Officer (PO)	Fuad Dahan	Pine Brook NJ/973-808-9050
Project Manager (PM)	Steven Gustems	Pine Brook NJ/973-808-9050
Senior Project Engineer (SPE)	Fuad Dahan	Pine Brook NJ/973-808-9050
Health and Safety Manager (HSM)	Joe Scardino	Pine Brook NJ/973-808-9050
Site Safety Officer (SSO)	Joe Scardino	Pine Brook NJ/973-808-9050
Field Supervisor (FS)	Todd Kelly	Pine Brook NJ/973-808-9050
Field Personnel	Jon Stuart	Pine Brook NJ/973-808-9050
Field Personnel	Taij Patel	Pine Brook NJ/973-808-9050
Subcontractors		
Company/Role	Name	Address/Telephone No.
Alpha Analytical Labs	Analytical Lab	Westborough, MA/201.972.6356
LDC	DUSR	Carlsbad, CA/760.827.1100

4.0 PERSONAL PROTECTIVE EQUIPMENT

4.1 Levels of Protection

PPE is required to safeguard site personnel from various hazards. Varying levels of protection may be required depending on the levels of COCs and the degree of physical hazard. This section presents the various levels of protection and defines the conditions of use for each level. A summary of the levels is presented in **Table 2** in Section 4.5.

4.1.1 Level D Protection

The minimum level of protection that will be required of project personnel at the site will be Level D, which will be worn when site conditions or air monitoring indicates no inhalation hazard exists. The following equipment will be used:

- Work clothing as prescribed by weather;
- Steel toe work boots, meeting American National Standards Institute (ANSI) Z41;
- Safety glasses or goggles, meeting ANSI Z87;
- Leather work gloves and/or nitrile surgical gloves;
- Hard hat, meeting ANSI Z89, when falling object hazards are present;
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used); and
- PFD if working on or near the water.

4.1.2 Modified Level D Protection

Modified Level D will be used when airborne contaminants are not present at levels of concern, but site activities present an increased potential for skin contact with contaminated materials. Modified Level D consists of:

- Nitrile gloves worn over nitrile surgical gloves;
- Latex/polyvinyl chloride (PVC) overboots when contact with COC-impacted media is anticipated;
- Steel toe work boots, meeting ANSI Z41;
- Safety glasses or goggles, meeting ANSI Z87;
- Face shield in addition to safety glasses or goggles when projectiles or splash hazards exist (e.g. during Power Washing activities);
- Hard hat, meeting ANSI Z89, when falling object hazards are present;
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used);
- Tyvek[®] suit (polyethylene coated Tyvek[®] suits for handling liquids) when body contact with COC-impacted media is anticipated; and
- PFD if working on or near the water.

4.1.3 Level C Protection

Level C protection will be required when the airborne concentration of COC reaches one-half of the OSHA Permissible Exposure Limit or ACGIH TLV. The following equipment will be used for Level C protection:

- Full-face, air-purifying respirator with combination organic vapor/HEPA cartridges;
- Polyethylene-coated Tyvek[®] suit, with ankles and cuffs taped to boots and gloves;
- Nitrile gloves worn over nitrile surgical gloves;
- Steel toe work boots, meeting ANSI Z41;
- Chemical-resistant boots with steel toes or latex/PVC overboots over steel toe boots;
- Hard hat, meeting ANSI Z89;
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used); and
- PFD if working on or near the water.

4.2 Selection of PPE

Equipment for personal protection will be selected based on the potential for contact, site conditions, ambient air quality, and the judgment of supervising site personnel and health and safety professionals. The PPE used will be chosen to be effective against the COCs present on the site

4.3 Site Respiratory Protection Program

Respiratory protection is an integral part of employee health and safety at the site due to potentially hazardous concentrations of airborne COCs. The site respiratory protection program will consist of the following (as a minimum):

- All on-site personnel who may use respiratory protection will have an assigned respirator.
- All on-site personnel who may use respiratory protection will have been fit tested and trained in the use of a full-face air-purifying respirator within the past 12 months. Documentation of the fit test must be provided to the SSO prior to commencement of work.
- All on-site personnel who may use respiratory protection must within the past year have been medically certified as being capable of wearing a respirator.

Documentation of the medical certification must be provided to the SSO, prior to commencement of site work.

- Only cleaned, maintained, NIOSH-approved respirators will be used.
- If respirators are used, the respirator cartridge is to be properly disposed of at the end of each work shift, or when load-up or breakthrough occurs.
- Contact lenses are not to be worn when a respirator is worn.
- All on-site personnel who may use respiratory protection must be clean-shaven.

Mustaches and sideburns are permitted, but they must not touch the sealing surface of the respirator.

- Respirators will be inspected, and a negative pressure test performed prior to each use.
- After each use, the respirator will be wiped with a disinfectant, cleansing wipe.

When used, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location, in a manner that will not distort the face piece.

4.4 Using PPE

Depending upon the level of protection selected, specific donning and doffing procedures may be required. The procedures presented in this section are mandatory if Modified Level D or Level C PPE is used. All personnel entering the EZ must put on the required PPE in accordance with the requirements of this HASP. When leaving the EZ, PPE will be removed in accordance with the procedures listed, to minimize the spread of COCs.

4.4.1 Donning Procedures

These procedures are mandatory only if Modified Level D or Level C PPE is used on the site:

- Remove bulky outerwear. Remove street clothes and store in clean location;

- Put on work clothes or coveralls;
- Put on the required chemical protective coveralls;
- Put on the required chemical protective boots or boot covers;
- Tape the legs of the coveralls to the boots with duct tape;
- Put on the required chemical protective gloves;
- Tape the wrists of the protective coveralls to the gloves;
- Don the required respirator and perform appropriate fit check (Level C);
- Put hood or head covering over head and respirator straps and tape hood to facepiece (Level C); and
- Don remaining PPE, such as safety glasses or goggles and hard hat.

When these procedures are instituted, one person must remain outside the work area to ensure that each person entering has the proper protective equipment.

4.4.2 Doffing Procedures

The following procedures are only mandatory if Modified Level D or Level C PPE is required for the site. Whenever a person leaves the work area, the following decontamination sequence will be followed:

- Upon entering the CRZ, rinse contaminated materials from the boots or remove contaminated boot covers;
- Clean reusable protective equipment;
- Remove protective garments, equipment, and respirator (Level C). All disposable clothing should be placed in plastic bags, which are labeled with contaminated waste labels;
- Wash hands, face, and neck (or shower if necessary);
- Proceed to clean area and dress in clean clothing; and
- Clean and disinfect respirator for next use.

All disposable equipment, garments, and PPE must be bagged in plastic bags, labeled for disposal. See Section 7, Decontamination, for detailed information on decontamination stations.

4.5 Selection Matrix

The level of personal protection selected will be based on air monitoring of the work environment and an assessment by the FS and SSO of the potential for skin contact with COCs. The PPE selection matrix is presented in **Table 2** below. This matrix is based on information available at the time this plan was written. The Airborne Contaminant Action Levels in **Table 3** in Section 5.4, Airborne Contaminant Action Levels, should be used to verify that the PPE prescribed in these matrices is appropriate.

Table 2 – PPE Selection Matrix

Task	Anticipated Level of Protection
Mobilization	Level D
Subsurface Intrusive Activities (Excavation, Drilling)	Modified Level D/Level C
Earthwork/Grading	Level D
Chemical Sampling / Delineation	Modified Level D/Level C
Decontamination	Modified Level D
Demobilization	Level D

5.0 AIR AND NOISE MONITORING

5.1 Air Monitoring

Air monitoring, sampling, and testing will be conducted to determine employee exposure to airborne constituents. The monitoring results will dictate work procedures and the selection of PPE. The SESI SSO will be responsible for defining appropriate air monitoring procedures and for utilizing the air monitoring results to determine appropriate procedures and PPE for project personnel. Air monitoring results should be recorded in field notebooks or on an air monitoring log (see Attachment 1 for a copy of the Air Monitoring Log). Any deviations from the procedures listed here should be documented and explained in the Air Monitoring Log.

The monitoring devices to be used are a PDR1000 particulate monitor (or equivalent) and a Rae Systems MultiRAE detector (PID with a 11.7 eV lamp/oxygen/LEL/hydrogen sulfide sensors). Colorimetric detector tubes may be utilized to estimate airborne concentrations of benzene and should be onsite during any activities that may result in elevated PID readings including drilling, excavating, and groundwater sampling.

Air monitoring will be conducted continuously with the LEL/Oxygen meter during drilling in areas where flammable vapors or gases are suspect. All work activity must stop where tests indicate the concentration of flammable vapors exceeds 10% of the LEL at a location with a potential ignition source. Such an area must be ventilated to reduce the concentration to an acceptable level.

5.2 Noise Monitoring

Noise monitoring may be conducted as required. Hearing protection is mandatory for all employees in noise hazardous areas, such as around heavy equipment. As a general rule, sound levels that cause speech interference at normal conversation distance should require the use of hearing protection.

5.3 Monitoring Equipment Maintenance and Calibration

All direct-reading instrumentation calibrations should be conducted under the approximate environmental conditions the instrument will be used. Instruments must be calibrated before and after use, noting the reading(s) and any adjustments that are necessary. All air monitoring equipment calibrations, including the standard used for calibration, must be documented on a calibration log or in the field notebook. All completed health and safety documentation/forms must be reviewed by the SSO and maintained by the FS.

All air monitoring equipment will be maintained and calibrated in accordance with the specific manufacturer's procedures. Preventive maintenance and repairs will be conducted in accordance with the respective manufacturer's procedures. When applicable, only manufacturer-trained and/or authorized personnel will be allowed to perform instrument repairs or preventive maintenance.

If an instrument is found to be inoperative or suspected of giving erroneous readings, the SSO must be responsible for immediately removing the instrument from service and obtaining a replacement unit. If the instrument is essential for safe operation during a specific activity, that activity must cease until an appropriate replacement unit is obtained. The SSO will be responsible for ensuring a replacement unit is obtained and/or repairs are initiated on the defective equipment.

5.4 Action Levels

Table 3 presents airborne contaminant action levels that will be used to determine the procedures and protective equipment necessary based on conditions as measured at the site.

Table 3 – Airborne Contaminant Action Levels

Parameter	Reading	Action
Total Hydrocarbons	0 ppm to \leq 1 ppm	Normal operations; continue hourly breathing zone monitoring
	> 1 ppm to 5 ppm	Increase monitoring frequency to every 15 minutes and use benzene detector tube to screen for the presence of benzene
	\geq 5 ppm to \leq 50 ppm	Upgrade to Level C PPE; continue screening for benzene
	> 50 ppm	Stop work; investigate cause of reading
	At any reading > 5 ppm	Monitor perimeter per CAMP
PCE	\geq 1 ppm to 5 ppm	Upgrade to Level C PPE
	> 5 ppm	Stop work; investigate cause of reading
Dust	0 to .05 mg/m ³	Normal operations
	0.05 to 0.1 mg/m ³	Begin soil wetting procedure (Level C protection would be needed beyond this point)
	> 0.15 mg/m ³	Stop work, fully implement dust control plan
Oxygen	\leq 19.5%	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
	> 19.5% to < 23.5%	Normal operations
	\geq 23.5%	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
Carbon Monoxide	0 ppm to \leq 20 ppm	Normal operations
	> 20 ppm	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
Hydrogen Sulfide	0 ppm to \leq 5 ppm	Normal operations
	> 5 ppm	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
Flammable Vapors (LEL)	< 10% LEL	Normal operations
	\geq 10% LEL	Stop work, ventilate area, investigate source of vapors

6.0 WORK ZONES AND DECONTAMINATION

6.1 Work Zones

6.1.1 Authorization to Enter

Only personnel with the appropriate training and medical certifications (if respirators are required) will be allowed to work at the project site. The FS will maintain a list of authorized persons; only personnel on the authorized persons list will be allowed to enter the site work areas.

6.1.2 Site Orientation and Hazard Briefing

No person will be allowed in the work area during site operations without first being given a site orientation and hazard briefing. This orientation will be presented by the FS or SSO and will consist of a review of this HASP. This review must cover the chemical, physical, and biological hazards, protective equipment, safe work procedures, and emergency procedures for the project. Following this initial meeting, daily safety meetings will be held each day before work begins.

All people entering the site work areas, including visitors, must document their attendance at this briefing, as well as the daily safety meetings on the forms included with this plan.

6.1.3 Certification Documents

A training and medical file may be established for the project and kept on site during all site operations. Specialty training, such as first aid/cardiopulmonary resuscitation (CPR) certificates, as well as current medical clearances for all project field personnel required to wear respirators, will be maintained within that file. All project personnel must provide their training and medical documentation to the SSO prior to starting work.

6.1.4 Entry Log

A log-in/log-out sheet will be maintained at the site by the FS. Personnel must sign in and out on a log sheet as they enter and leave the work area, and the FS may document entry and exit in the field notebook.

6.1.5 Entry Requirements

In addition to the authorization, hazard briefing, and certification requirements listed above, no person will be allowed in any SESI work area unless they are wearing the minimum PPE as described in Section 4.0.

6.1.6 Emergency Entry and Exit

People who must enter the work area on an emergency basis will be briefed of the hazards by the FS or SSO. All activities will cease in the event of an emergency. People exiting the work area because of an emergency will gather in a designated safe area for a head count. The FS is responsible for ensuring that all people who entered the work area have exited in the event of an emergency.

6.1.7 Contamination Control Zones

Contamination control zones are maintained to prevent the spread of contamination and to prevent unauthorized people from entering hazardous areas.

6.1.8 Exclusion Zone (EZ)

An EZ may consist of a specific work area or may be the entire area of potential contamination. All employees entering an EZ must use the required PPE and must have the appropriate training and medical clearance for hazardous waste work. The EZ is the defined area where there is a possible respiratory and/or contact health hazard. Cones, caution tape, or a posted site diagram will identify the location of each EZ.

6.1.9 Contamination Reduction Zone

The CRZ or transition area will be established, if necessary, to perform decontamination of personnel and equipment. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination. Tools, equipment, and machinery will be

decontaminated in a specific location. The decontamination of all personnel will be performed on site adjacent to the EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and prepared for cleaning or disposal. This zone is the only appropriate corridor between the EZ and the support zone (SZ) discussed below.

6.1.10 Support Zone (SZ)

The SZ is a clean area outside the CRZ located to prevent employee exposure to hazardous substances. Eating and drinking will be permitted in the support area only after proper decontamination. Smoking may be permitted in the SZ, subject to site requirements.

6.1.11 Posting

Work areas will be prominently marked and delineated using cones, caution tape, or a posted site diagram.

6.1.12 Site Inspections

The FS will conduct a daily inspection of site activities, equipment, and procedures to verify that the required elements are in place.

6.2 Decontamination

6.2.1 Personnel Decontamination

All personnel wearing Modified Level D or Level C protective equipment in the EZ must undergo personal decontamination prior to entering the SZ. The personnel decontamination area will consist of the following stations at a minimum:

- *Station 1:* Personnel leaving the contaminated zone will remove the gross contamination from their outer clothing and boots.
- *Station 2:* Personnel will remove their outer garment and gloves and dispose of it in properly labeled containers. Personnel will then decontaminate their hard hats, and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items are then hand carried to the next station.
- *Station 3:* Personnel will thoroughly wash their hands and face before leaving the CRZ. Respirators will be sanitized and then placed in a clean plastic bag.

6.2.2 Equipment Decontamination

All vehicles that have entered the EZ will be decontaminated at the decontamination pad prior to leaving the zone. If the level of vehicle contamination is low, decontamination may be limited to rinsing of tires and wheel wells with water. If the vehicle is significantly contaminated, steam cleaning or pressure washing of vehicles and equipment may be required.

6.2.3 Personal Protective Equipment Decontamination

Where and whenever possible, single-use, external protective clothing must be used for work within the EZ or CRZ. This protective clothing must be disposed of in properly labeled containers. Reusable protective clothing will be rinsed at the site with detergent and water. The rinsate will be collected for disposal.

When removed from the CRZ, the respirator will be thoroughly cleaned with soap and water. The respirator face piece, straps, valves, and covers must be thoroughly cleaned at the end of each work shift, and ready for use prior to the next shift. Respirator parts may be disinfected with a solution of bleach and water (mixed at 2% bleach by volume), or by using a spray disinfectant.

7.0 TRAINING AND MEDICAL SURVEILLANCE

7.1 Training

7.1.1 General

All on-site project personnel who work in areas where they may be exposed to site contaminants must be trained as required by OSHA Regulation 29 CFR 1910.120 (HAZWOPER). Field employees also must receive a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor. Personnel who completed their initial training more than 12 months prior to the start of the project must have completed an eight-hour refresher course within the past 12 months. The FS must have completed an additional eight hours of supervisory training and must have a current first-aid/CPR certificate (See Attachment 2).

7.1.2 Basic 40-Hour Course

The following is a list of the topics typically covered in a 40-hour HAZWOPER training course:

- General safety procedures;
- Physical hazards (fall protection, noise, heat stress, cold stress);
- Names and job descriptions of key personnel responsible for site health and safety;
- Safety, health, and other hazards typically present at hazardous waste sites;
- Use, application, and limitations of PPE;
- Work practices by which employees can minimize risks from hazards;
- Safe use of engineering controls and equipment on site;
- Medical surveillance requirements;
- Recognition of symptoms and signs which might indicate overexposure to hazards;
- Worker right-to-know (Hazard Communication OSHA 1910.1200);
- Routes of exposure to contaminants;
- Engineering controls and safe work practices;
- Components of a health and safety program and a site-specific HASP;
- Decontamination practices for personnel and equipment;
- Confined-space entry procedures; and
- General emergency response procedures.

7.1.3 Supervisor Course

Management and supervisors must receive an additional eight hours of training, which typically includes:

- General site safety and health procedures;
- PPE programs; and
- Air monitoring techniques.

7.1.4 Site-Specific Training

Site-specific training will be accomplished by on-site personnel reading this HASP, and through a thorough site briefing by the PM, FS, or SSO on the contents of this HASP before work begins. The review must include a discussion of the chemical, physical, and biological hazards; the protective equipment and safety procedures; and emergency procedures.

7.1.5 Daily Safety Meetings

Daily safety meetings will be held to cover the work to be accomplished, the hazards anticipated, the PPE and procedures required to minimize site hazards, and emergency procedures. The FS or SSO should present these meetings prior to beginning the day's fieldwork. No work will be performed in an EZ before a daily safety meeting has been held. An additional safety meeting must also be held prior to new tasks, or if new hazards are encountered. The daily safety meetings will be logged in the field notebook.

7.1.6 First Aid and CPR

At least one employee current in first aid/CPR will be assigned to the work crew and will be on the site during operations. Site records will document the presence of this individual. Refresher training in first aid (triennially) and CPR (annually) is required to keep the certificate current. These individuals must also receive training regarding the precautions and protective equipment necessary to protect against exposure to blood-borne pathogens.

7.2 Medical Surveillance

7.2.1 Medical Examination

All personnel who are potentially exposed to site contaminants must participate in a medical surveillance program as defined by OSHA at 29 CFR 1910.120 (f).

7.2.2 Pre-placement Medical Examination

All potentially exposed personnel must have completed a comprehensive medical examination prior to assignment, and periodically thereafter as defined by applicable regulations. The pre-placement and periodic medical examinations typically include the following elements:

- Medical and occupational history questionnaire;
- Physical examination;
- Complete blood count, with differential;
- Liver enzyme profile;
- Chest X-ray, at a frequency determined by the physician;
- Pulmonary function test;
- Audiogram;
- Electrocardiogram for persons older than 45 years of age, or if indicated during the physical examination;
- Drug and alcohol screening, as required by job assignment;
- Visual acuity; and
- Follow-up examinations, at the discretion of the examining physician or the corporate medical director.

The examining physician provides the employee with a letter summarizing his findings and recommendations, confirming the worker's fitness for work and ability to wear a

respirator. Documentation of medical clearance will be available for each employee during all project site work.

Subcontractors will certify that all their employees have successfully completed a physical examination by a qualified physician. The physical examinations must meet the requirements of 29 CFR 1910.120 and 29 CFR 1910.134. Subcontractors will supply copies of the medical examination certificate for each on-site employee.

7.2.3 Other Medical Examinations

In addition to pre-employment, annual, and exit physicals, personnel may be examined:

- At employee request after known or suspected exposure to toxic or hazardous materials; and
- At the discretion of the SSO, HSM, or occupational physician in anticipation of, or after known or suspected exposure to toxic or hazardous materials.

7.2.4 Periodic Exam

Following the placement examination, all employees must undergo a periodic examination, similar in scope to the placement examination. For employees potentially exposed over 30 days per year, the frequency of periodic examinations will be annual. For employees potentially exposed less than 30 days per year, the frequency for periodic examinations will be 24 months.

7.2.5 Medical Restriction

When the examining physician identifies a need to restrict work activity, the employee's supervisor must communicate the restriction to the employee and the SSO. The terms of the restriction will be discussed with the employee and the supervisor.

8.0 GENERAL SAFETY PRACTICES

8.1 General Safety Rules

General safety rules for site activities include, but are not limited to, the following:

- At least one copy of this HASP must be in a location at the site that is readily available to personnel, and all project personnel shall review the plan prior to starting work.
- Consume or use food, beverages, chewing gum, and tobacco products only in the SZ or other designated area outside the EZ and CRZ. Cosmetics shall not be applied in the EZ or CRZ.
- Wash hands before eating, drinking, smoking, or using toilet facilities.
- Wear all PPE as required and stop work and replace damaged PPE immediately.
- Secure disposable coveralls, boots, and gloves at the wrists and legs and ensure closure of the suit around the neck.
- Upon skin contact with materials that may be impacted by COCs, remove contaminated clothing and wash the affected area immediately. Contaminated clothing must be changed. Any skin contact with materials potentially impacted by COCs must be reported to the FS or SSO immediately. If needed, medical attention should be sought.

- Practice contamination avoidance. Avoid contact with surfaces either suspected or known to be impacted by COCs, such as standing water, mud, or discolored soil.
Equipment must be stored on elevated or protected surfaces to reduce the potential for incidental contamination.
- Remove PPE as required in the CRZ to limit the spread of COC-containing materials.
- At the end of each shift or as required, dispose of all single-use coveralls, soiled gloves, and respirator cartridges in designated receptacles designated for this purpose.
- Removing soil containing site COCs from protective clothing or equipment with compressed air, shaking, or any other means that disperses contaminants into the air is prohibited.
- Inspect all non-disposable PPE for contamination in the CRZ. Any PPE found to be contaminated must be decontaminated or disposed of appropriately.
- Recognize emergency signals used for evacuation, injury, fire, etc.
- Report all injuries, illnesses, and unsafe conditions or work practices to the FS or SSO.
- Use the “buddy system” during all operations requiring Level C PPE, and when appropriate, during Modified Level D operations.
- Obey all warning signs, tags, and barriers. Do not remove any warnings unless authorized to do so.
- Use, adjust, alter, and repair equipment only if trained and authorized to do so, and in accordance with the manufacturer’s directions.
- Personnel are to perform only tasks for which they have been properly trained and will advise their supervisor if they have been assigned a task for which they are not trained.
- The presence or consumption of alcoholic beverages or illicit drugs during the workday, including breaks, is strictly prohibited. Notify your supervisor if you must take prescription or over-the-counter drugs that indicate they may cause drowsiness or, that you should not operate heavy equipment.
- Remain upwind during site activities whenever possible.

8.2 Buddy System

On-site personnel must use the buddy system as required by operations. Use of the “buddy system” is required during all operations requiring Level C to Level A PPE, and when appropriate, during Level D operations. Crewmembers must observe each other for signs of chemical exposure, and heat or cold stress. Indications of adverse effects include, but are not limited to:

- Changes in complexion and skin coloration;
- Changes in coordination;
- Changes in demeanor;
- Excessive salivation and pupillary response; and
- Changes in speech pattern.

Crewmembers must also be aware of the potential exposure to possible safety hazards, unsafe acts, or non-compliance with safety procedures.

Field personnel must inform their partners or fellow crewmembers of non-visible effects of exposure to toxic materials that they may be experiencing. The symptoms of such exposure may include, but are not limited to:

- Headaches;
- Dizziness;
- Nausea;
- Blurred vision;
- Cramps; and
- Irritation of eyes, skin, or respiratory tract.

If protective equipment or noise levels impair communications, prearranged hand signals must be used for communication. Personnel must stay within line of sight of another team member.

8.3 Heat Stress

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, etc., as well as the physical and conditioning characteristics of the individual. Since heat stress is one of the most common illnesses associated with heavy outdoor work conducted with direct solar load and, in particular, because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses. Personnel must be aware of the types and causes of heat-related illnesses and be able to recognize the signs and symptoms of these illnesses in both themselves and their co-workers.

Heat rashes are one of the most common problems in hot work environments. Commonly known as prickly heat, a heat rash is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment.

Heat cramps are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused both by too much or too little salt.

Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution (plus or minus 0.3% NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.

Under extreme conditions, such as working for 6 to 8 hours in heavy protective gear, a loss of sodium may occur. Drinking commercially available carbohydrate electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

Heat exhaustion occurs from increased stress on various body organs due to inadequate blood circulation, cardiovascular insufficiency, or dehydration. Signs and symptoms include pale, cool, moist skin; heavy sweating; dizziness; nausea; headache, vertigo, weakness, thirst, and giddiness. Fortunately, this condition responds readily to prompt treatment.

Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, which is a medical emergency. Workers suffering from heat exhaustion should be removed from the hot environment, be given fluid replacement, and be encouraged to get adequate rest.

Heat stroke is the most serious form of heat stress. Heat stroke occurs when the body's system of temperature regulation fails and the body's temperature rises to critical levels. This condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict. Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature, e.g., a rectal temperature of 41°C (105.8°F). If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of workload and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.

If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first aid treatment.

Regardless of the worker's protestations, no employee suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order.

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or exhaustion, that person may be predisposed to additional heat injuries.

8.4 Heat Stress Safety Precautions

Heat stress monitoring and work rest cycle implementation should commence when the ambient adjusted temperature exceeds 72°F. A minimum work rest regimen and procedures for calculating ambient adjusted temperature are described in **Table 4** below.

Table 4 – Work/Rest Schedule

Adjusted Temperature^b	Work/Rest Regimen Normal Work Ensemble^c	Work/Rest Regimen Impermeable Ensemble
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5° - 90°F (30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5° - 87.5°F (28.1° - 30.8°C)	After each 90 minutes of work	After each 60 minutes of work

77.5° - 82.5°F (25.3° - 28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5° - 77.5°F (30.8° - 32.2°C)	After each 150 minutes of work	After each 120 minutes of work

- a. For work levels of 250 kilocalories/hour (Light-Moderate Type of Work)
- b. Calculate the adjusted air temperature (ta adj) by using this equation: $ta\ adj\ ^\circ F = ta\ ^\circ F + (13 \times \% \text{ sunshine})$. Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)
- c. A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.
- d. The information presented above was generated using the information provided in the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV) Handbook.

In order to determine if the work rest cycles are adequate for the personnel and specific site conditions, additional monitoring of individual heart rates will be conducted during the rest cycle. To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one third and maintain the same rest period.

Additionally, one or more of the following control measures can be used to help control heat stress and are mandatory if any site worker has a heart rate (measure immediately prior to rest period) exceeding 115 beats per minute:

- Site workers will be encouraged to drink plenty of water and electrolyte replacement fluids throughout the day.
- On-site drinking water will be kept cool (50 to 60°F).
- A work regimen that will provide adequate rest periods for cooling down will be established, as required.
- All personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion, and heat cramps.
- Cooling devices, such as vortex tubes or cooling vests, should be used when personnel must wear impermeable clothing in conditions of extreme heat.
- Employees should be instructed to monitor themselves and co-workers for signs of heat stress and to take additional breaks as necessary.
- A shaded rest area must be provided. All breaks should take place in the shaded rest area.
- Employees must not be assigned to other tasks during breaks.
- Employees must remove impermeable garments during rest periods. This includes white Tyvek-type garments.

All employees must be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress disorders.

8.5 Cold Stress

Cold stress normally occurs in temperatures at or below freezing, or under certain circumstances, in temperatures of 40°F. Extreme cold for a short time may cause severe injury to exposed body surfaces or result in profound generalized cooling, causing death. Areas of the body that have high surface area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible. Two factors influence the development of a cold weather injury: ambient temperature and the velocity of the wind. For instance, 10°F with a wind of

15 miles per hour (mph) is equivalent in chilling effect to still air at 18°F. An equivalent chill temperature chart relating the actual dry bulb temperature and wind velocity is presented in **Table 5** below.

Table 5 – Wind Chill Temperature Chart

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
Equivalent Chill Temperature (°F)												
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.			

Trench foot and immersion foot may occur at any point on this chart.
 [This chart was developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA (Source: ACGIH Threshold Limit Values for Chemical Substances and Physical Agents)].

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of tissue damage associated with frostbite. Frostbite of the extremities can be categorized into:

- *Frost Nip or Incipient Frostbite* - characterized by sudden blanching or whitening of skin.
- *Superficial Frostbite* - skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- *Deep Frostbite* - tissues are cold, pale, and solid; extremely serious injury.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. It can be fatal. Its symptoms are usually exhibited in five stages: 1) shivering; 2) apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95°F; 3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate; 4) freezing of the extremities; and 5) death. Trauma sustained in freezing or sub-zero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues in addition to providing for first aid treatment. To avoid cold stress, site personnel must wear protective clothing appropriate for the level of cold and physical activity. In addition to protective clothing, preventive safe work practices, additional training, and warming regimens may be utilized to prevent cold stress.

8.6 Safety Precautions for Cold Stress Prevention

For air temperature of 0°F or less, mittens should be used to protect the hands. For exposed skin, continuous exposure should not be permitted when air speed and temperature results in a wind chill temperature of -25°F.

At air temperatures of 36°F or less, field personnel who become immersed in water or whose clothing becomes wet must be immediately provided with a change of clothing and be treated for hypothermia.

If work is done at normal temperature or in a hot environment before entering the cold, the field personnel must ensure that their clothing is not wet as a consequence of sweating. Wet field personnel must change into dry clothes prior to entering the cold area.

If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work must be modified or suspended until adequate clothing is made available or until weather conditions improve.

Field personnel handling evaporative liquid (e.g., gasoline, alcohol, or cleaning fluids) at air temperatures below 40°F must take special precaution to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling.

8.7 Safe Work Practices

Direct contact between bare skin and cold surfaces (< 20°F) should be avoided. Metal tool handles and/or equipment controls should be covered by thermal insulating material.

For work performed in a wind chill temperature at or below 10°F, workers should be under constant protective observation (buddy system). The work rate should be established to prevent heavy sweating that will result in wet clothing. For heavy work, rest periods must be taken in heated shelters and workers should be provided with an opportunity to change into dry clothing if needed.

Field personnel should be provided the opportunity to become accustomed to cold-weather working conditions and required protective clothing. Work should be arranged in such a way that sitting or standing still for long periods is minimized.

During the warming regimen (rest period), field personnel should be encouraged to remove outer clothing to permit sweat evaporation or to change into dry work clothing. Dehydration, or loss of body fluids, occurs insidiously in the cold environment and may increase susceptibility to cold injury due to a significant change in blood flow to the extremities. Fluid replacement with warm, sweet drinks and soups is recommended. The intake of coffee should be limited because of diuretic and circulatory effects.

8.8 Biological Hazards

Biological hazards may include poison ivy, snakes, thorny bushes and trees, ticks, mosquitoes, spiders, and other pests.

8.8.1 Tick Borne Diseases

Lyme Disease - The disease commonly occurs in summer and is transmitted by the bite of infected ticks. "Hot spots" in the United States include New York, New Jersey, Pennsylvania, Massachusetts, Connecticut, Rhode Island, Minnesota, and Wisconsin.

Erlichiosis - The disease also commonly occurs in summer and is transmitted by the bite of infected ticks. "Hot spots" in the United States include New York, Massachusetts, Connecticut, Rhode Island, Minnesota, and Wisconsin.

These diseases are transmitted primarily by the deer tick, which is smaller and redder than the common wood tick. The disease may be transmitted by immature ticks, which are small and hard to see. The tick may be as small as a period on this page.

Symptoms of Lyme disease include a rash or a peculiar red spot, like a bull's eye, which expands outward in a circular manner. The victim may have headache, weakness, fever, a stiff neck, and swelling and pain in the joints, and eventually, arthritis. Symptoms of

erlichiosis include muscle and joint aches, flu-like symptoms, but there is typically no skin rash.

Rocky Mountain Spotted Fever (RMSF) - This disease is transmitted via the bite of an infected tick. The tick must be attached 4 to 6 hours before the disease-causing organism (*Rickettsia rickettsii*) becomes reactivated and can infect humans. The primary symptom of RMSF is the sudden appearance of a moderate-to-high fever. The fever may persist for two to three weeks. The victim may also have a headache, deep muscle pain, and chills. A rash appears on the hands and feet on about the third day and eventually spreads to all parts of the body. For this reason, RMSF may be confused with measles or meningitis. The disease may cause death, if untreated, but if identified and treated promptly, death is uncommon.

Control - Tick repellent containing diethyltoluamide (DEET) should be used when working in tick-infested areas, and pant legs should be tucked into boots. In addition, workers should search the entire body every three or four hours for attached ticks. Ticks should be removed promptly and carefully without crushing, since crushing can squeeze the disease-causing organism into the skin. A gentle and steady pulling action should be used to avoid leaving the head or mouth parts in the skin. Hands should be protected with surgical gloves when removing ticks.

8.8.2 Poisonous Plants

Poisonous plants may be present in the work area. Personnel should be alerted to its presence and instructed on methods to prevent exposure.

Control - The main control is to avoid contact with the plant, cover arms and hands, and frequently wash potentially exposed skin. Particular attention must be given to avoiding skin contact with objects or protective clothing that have touched the plants. Treat every surface that may have touched the plant as contaminated, and practice contamination avoidance. If skin contact is made, the area should be washed immediately with soap and water and observed for signs of reddening.

8.8.3 Snakes

The possibility of encountering snakes exists, specifically for personnel working in wooded/vegetated areas. Snake venoms are complex and include proteins, some of which have enzymatic activity. The effects produced by venoms include neurotoxic effects with sensory, motor, cardiac, and respiratory difficulties; cytotoxic effects on red blood cells, blood vessels, heart muscle, kidneys, and lungs; defects in coagulation; and effects from local release of substances by enzymatic actions. Other noticeable effects of venomous snakebites include swelling, edema, and pain around the bite, and the development of ecchymosis (the escape of blood into tissues from ruptured blood vessels).

Control - To minimize the threat of snakebites, all personnel walking through vegetated areas must be aware of the potential for encountering snakes, and the need to avoid actions potentiating encounters, such as turning over logs, etc. If a snakebite occurs, an attempt should be made to safely identify the snake via size and markings. The victim must be transported to the nearest hospital within 30 minutes; first aid consists of applying a constriction band and washing the area around the wound to remove any unabsorbed venom.

8.8.4 Spiders

Personnel may encounter spiders during work activities.

Two spiders are of concern, the black widow and the brown recluse. Both prefer dark sheltered areas such as basements, equipment sheds and enclosures, and around woodpiles or other scattered debris. The black widow is shiny black, approximately one inch long, and found throughout the United States. There is a distinctive red hourglass marking on the underside of the black widows body. The bite of a black widow is seldom fatal to healthy adults, but effects include respiratory distress, nausea, vomiting, and muscle spasms. The brown recluse is smaller than the black widow and gets its name from its brown coloring and behavior. The brown recluse is more prevalent in the southern United States. The brown recluse has a distinctive violin shape on the top of its body. The bite of the brown recluse is painful and the bite site ulcerates and takes many weeks to heal completely.

Control - To minimize the threat of spider bites, all personnel walking through vegetated areas must be aware of the potential for encountering these arachnids. Personnel need to avoid actions that may result in encounters, such as turning over logs, and placing hands in dark places such as behind equipment or in corners of equipment sheds or enclosures. If a spider bite occurs, the victim must be transported to the nearest hospital as soon as possible; first aid consists of applying ice packs and washing the area around the wound to remove any unabsorbed venom.

8.9 Noise

Exposure to noise over the OSHA action level can cause temporary impairment of hearing; prolonged and repeated exposure can cause permanent damage to hearing. The risk and severity of hearing loss increases with the intensity and duration of exposure to noise. In addition to damaging hearing, noise can impair voice communication, thereby increasing the risk of accidents on site.

Control - All personnel must wear hearing protection, with a Noise Reduction Rating (NRR) of at least 20, when noise levels exceed 85 dBA. When it is difficult to hear a co-worker at normal conversation distance, the noise level is approaching or exceeding 85 dBA, and hearing protection is necessary. All site personnel who may be exposed to noise must also receive baseline and annual audiograms and training as to the causes and prevention of hearing loss. Noise monitoring is discussed in **Section 5.2**, Noise Monitoring.

Whenever possible, equipment that does not generate excessive noise levels will be selected for this project. If the use of noisy equipment is unavoidable, barriers or increased distance will be used to minimize worker exposure to noise, if feasible.

8.10 Spill Control

All personnel must take every precaution to minimize the potential for spills during site operations. All on-site personnel shall immediately report any discharge, no matter how small, to the FS.

Spill control equipment and materials will be located on the site at locations that present the potential for discharge. All sorbent materials used for the cleanup of spills will be containerized and labeled appropriately. In the event of a spill, the FS will follow the provisions in Section 10.0, Emergency Procedures, to contain and control released materials and to prevent their spread to off-site areas.

8.11 Sanitation

Site sanitation will be maintained according to OSHA requirements.

8.11.1 Break Area

Breaks must be taken in the SZ, away from the active work area after site personnel go through decontamination procedures. There will be no smoking, eating, drinking, or chewing gum or tobacco in any area other than the SZ.

8.11.2 Potable Water

The following rules apply to all field operations:

- An adequate supply of potable water will be provided at each project site. Potable water must be kept away from hazardous materials or media, and contaminated clothing or equipment.
- Portable containers used to dispense drinking water must be capable of being tightly closed and must be equipped with a tap dispenser. Water must not be consumed directly from the container (drinking from the tap is prohibited) nor may it be removed from the container by dipping.
- Containers used for drinking water must be clearly marked and shall not be used for any other purpose.
- Disposable drinking cups must be provided. A sanitary container for dispensing cups and a receptacle for disposing of used cups is required.

8.11.3 Sanitary Facilities

Access to facilities for washing before eating, drinking, or smoking, or alternate methods such as waterless hand-cleaner and paper towels will be provided.

8.11.4 Lavatory

If permanent toilet facilities are not available, an appropriate number of portable chemical toilets will be provided. This requirement does not apply to mobile crews or to normally unattended site locations so long as employees at these locations have transportation immediately available to nearby toilet facilities.

8.12 Emergency Equipment

Adequate emergency equipment for the activities being conducted on site and as required by applicable sections of 29 CFR 1910 and 29 CFR 1926 will be on site prior to the commencement of project activities. Personnel will be provided with access to emergency equipment, including, but not limited to, the following:

- Fire extinguishers of adequate size, class, number, and location as required by applicable sections of 29 CFR 1910 and 1926;
- Industrial first aid kits of adequate size for the number of personnel on site; and
- Emergency eyewash and/or shower if required by operations being conducted on site.

8.13 Lockout/Tagout Procedures

Only fully qualified and trained personnel will perform maintenance procedures. Before maintenance begins, lockout/tagout procedures per OSHA 29 CFR 1910.147 will be followed.

Lockout is the placement of a device that uses a positive means, such as lock, to hold an energy or material-isolating device such that the equipment cannot be operated until the lockout device is removed. If a device cannot be locked out, a tagout system shall be

used. Tagout is the placement of a warning tag on an energy or material isolating device indicating that the equipment controls may not be operated until the personnel who attached the tag remove the tag.

8.14 Electrical Safety

Electricity may pose a particular hazard to site workers due to the use of portable electrical equipment. If wiring or other electrical work is needed, a qualified electrician must perform it.

General electrical safety requirements include:

- All electrical wiring and equipment must be a type listed by Underwriters Laboratories (UL), Factory Mutual Engineering Corporation (FM), or other recognized testing or listing agency.
- All installations must comply with the National Electrical Safety Code (NESC), the National Electrical Code (NEC), or USCG regulations.
- Portable and semi-portable tools and equipment must be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle.
- Tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double insulated tools must be distinctly marked and listed by UL or FM.
- Live parts of wiring or equipment must be guarded to prevent persons or objects from touching them.
- Electric wire or flexible cord passing through work areas must be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.
- All circuits must be protected from overload.
- Temporary power lines, switchboxes, receptacle boxes, metal cabinets, and enclosures around equipment must be marked to indicate the maximum operating voltage.
- Plugs and receptacles must be kept out of water unless of an approved submersible construction.
- All extension cord outlets must be equipped with ground fault circuit interrupters (GFCI).

- Attachment plugs or other connectors must be equipped with a cord grip and be constructed to endure rough treatment.
- Extension cords or cables must be inspected prior to each use and replaced if worn or damaged. Cords and cables must not be fastened with staples, hung from nails, or suspended by bare wire.
- Flexible cords must be used only in continuous lengths without splice, with the exception of molded or vulcanized splices made by a qualified electrician.

8.15 Lifting Safety

Using proper lifting techniques may prevent back strain or injury. The fundamentals of proper lifting include:

- Consider the size, shape, and weight of the object to be lifted. A mechanical lifting device or additional persons must be used to lift an object if it cannot be lifted safely alone.
- The hands and the object should be free of dirt or grease that could prevent a firm grip.
- Gloves must be used, and the object inspected for metal slivers, jagged edges, burrs, or rough or slippery surfaces.
- Fingers must be kept away from points that could crush or pinch them, especially when putting an object down.
- Feet must be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear.
- The load should be kept as low as possible, close to the body with the knees bent.
- To lift the load, grip firmly and lift with the legs, keeping the back as straight as possible.
- A worker should not carry a load that he or she cannot see around or over.
- When putting an object down, the stance and position are identical to that for lifting;
 - the legs are bent at the knees, and the back is straight as the object is lowered.

8.16 Ladder Safety

When portable ladders are used for access to an upper landing surface, the ladder side rails shall extend at least 3 feet (9 m) above the upper landing surface to which the ladder is used to gain access; or, when such an extension is not possible because of the ladder's length, then the ladder shall be secured at its top to a rigid support that will not deflect, and a grasping device, such as a grabrail, shall be provided to assist employees in mounting and dismounting the ladder. In no case shall the extension be such that ladder deflection under a load would, by itself, cause the ladder to slip off its support.

- Ladders shall be maintained free of oil, grease, and other slipping hazards.
- Ladders shall not be loaded beyond the maximum intended load for which they were built, or beyond their manufacturer's rated capacity.
- Ladders shall be used only for the purpose for which they were designed.
- Non-self-supporting ladders shall be used at an angle such that the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder (the distance along the ladder between the foot and the top support).
- Wood job-made ladders with spliced side rails shall be used at an angle such that the horizontal distance is one-eighth the working length of the ladder.
- Fixed ladders shall be used at a pitch no greater than 90 degrees from the horizontal, as measured to the back side of the ladder.
- Ladders shall be used only on stable and level surfaces unless secured to prevent accidental displacement.
- Ladders shall not be used on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental displacement. Slip-resistant feet shall not be used as a substitute for care in placing, lashing, or holding a ladder that is used upon slippery surfaces, including, but not limited to, flat metal or concrete surfaces that are constructed so they cannot be prevented from becoming slippery.

- Ladders placed in any location where they can be displaced by workplace activities or traffic, such as in passageways, doorways, or driveways, shall be secured to prevent accidental displacement, or a barricade shall be used to keep the activities or traffic away from the ladder.
- The area around the top and bottom of ladders shall be kept clear.
- The top of a non-self-supporting ladder shall be placed with the two rails supported equally unless it is equipped with a single support attachment.
- Ladders shall not be moved, shifted, or extended while occupied.
- Ladders shall have non-conductive side rails if they are used where the employee or the ladder could contact exposed energized electrical equipment.
- The top, top step, or the step labeled that it or any step above it should not be used as a step.
- Cross-bracing on the rear section of stepladders shall not be used for climbing unless the ladders are designed and provided with steps for climbing on both front and rear sections.
- Ladders shall be inspected by the HSM for visible defects on a daily basis and after any occurrence that could affect their safe use.
- Portable ladders with structural defects, such as, but not limited to, broken or missing rungs, cleats, or steps; broken or split rails; corroded components; or other faulty or defective components shall either be immediately marked in a manner that readily identifies them as defective or be tagged with “Do Not Use” or similar language and shall be withdrawn from service.
- Fixed ladders with structural defects, such as, but not limited to, broken or missing rungs, cleats, or steps; broken or split rails; or corroded components; shall be withdrawn from service.
- Ladder repairs shall restore the ladder to a condition meeting its original design criteria, before the ladder is returned to use.
- Single-rail ladders shall not be used.
- When ascending or descending a ladder, the user shall face the ladder.
- Each employee shall use at least one hand to grasp the ladder when progressing up and/or down the ladder.
- An employee shall not carry any object or load that could cause the employee to lose balance and fall.

8.17 Traffic Safety

The project site may be located adjacent to a public roadway where exposure to vehicular traffic is likely. Traffic may also be encountered as vehicles enter and exit the area. To minimize the likelihood of project personnel and activities being affected by traffic, the following procedures will be implemented.

Cones must be placed along the shoulder of the roadway starting 100 feet from the work area to alert passing motorists to the presence of personnel and equipment. A “Slow” or “Men Working” sign must be placed at the first cone. Barricades with flashing lights should be placed between the roadway and the work area.

During activities along a roadway, equipment will be aligned parallel to the roadway to the extent feasible, facing into the oncoming traffic so as to place a barrier between the work crew and the oncoming traffic. All crewmembers must remain behind the equipment and the traffic barrier.

All site personnel who are potentially exposed to vehicular traffic must wear an outer layer of orange warning garments, such as vests, jackets, or shirts. If work is performed

in hours of dusk or darkness, workers will be outfitted with reflective garments either orange, white (including silver-coated reflective coatings or elements that reflect white light), yellow, fluorescent red-orange, or fluorescent yellow-orange.

The flow of traffic into and out of the adjacent business must be assessed, and precautions taken to warn motorists of the presence of workers and equipment. Where possible, vehicles should be aligned to provide physical protection of people and equipment.

9.0 SITE-SPECIFIC HAZARDS AND CONTROL MEASURES

9.1 Evaluation of Hazards

The evaluation of hazards is provided as a quick reference as to the known conditions for the Site, wherein the level of detail for each of the subsections is identified.

9.1.1 Hazard Characteristics

Existing information for Site:

Detailed Preliminary None

Hazardous/Contaminated Material Form(s):

Solid Liquid Sludge Gas Vapor

Containment Type(s):

Drum Tank Pit Debris
 Pond Lagoon Other:

Hazardous Material Characteristics:

Volatile Corrosive Reactive Radioactive
 Ignitable Toxic Unknown

Routes of Exposure:

Oral Dermal Eye Respiratory

9.1.2 Potential Health and Safety Hazards

<input checked="" type="checkbox"/> Heat	<input type="checkbox"/> Congested areas
<input checked="" type="checkbox"/> Cold	<input checked="" type="checkbox"/> General Construction
<input type="checkbox"/> Confined space entry	<input checked="" type="checkbox"/> Physical injury
<input type="checkbox"/> Oxygen depletion	<input checked="" type="checkbox"/> Electrical hazards
<input type="checkbox"/> Asphyxiation	<input checked="" type="checkbox"/> Handling and product transfer
<input checked="" type="checkbox"/> Excavation	<input checked="" type="checkbox"/> Fire
<input checked="" type="checkbox"/> Cave-ins	<input checked="" type="checkbox"/> Explosion
<input checked="" type="checkbox"/> Falls, slippage	<input checked="" type="checkbox"/> Biological Hazards
	<input checked="" type="checkbox"/> Plants – Poison Ivy, Poison Oak
	<input checked="" type="checkbox"/> Insects – Ticks
	<input checked="" type="checkbox"/> Insects – Mosquitoes
	<input checked="" type="checkbox"/> Insects – Bees and Wasps
	<input checked="" type="checkbox"/> Rats and Mice
<input checked="" type="checkbox"/> Heavy equipment etc.)	<input type="checkbox"/> Non-ionizing Radiation (i.e. UV, IR,
<input type="checkbox"/> Other: Potential Ignition Hazard.	

9.2 Field Activities, Hazards, and Control Procedures

The following task-specific safety analyses identify potential health, safety, and environmental hazards associated with each type of field activity. Because of the complex and changing nature of field projects, supervisors must continually inspect the site to identify hazards that may affect on-site personnel, the community, or the environment. The FS must be aware of these changing conditions and discuss them with the PM whenever these changes impact employee health, safety, the environment, or performance of the project. The FS will keep on-site personnel informed of the changing conditions, and the PM will write and/or approve addenda or revisions to this HASP as necessary.

9.2.1 Mobilization/Construction Stakeout

Description of tasks

Site mobilization will include establishing excavation locations, determining the location of utilities and other installations, and establishing work areas. Mobilization will also include setting up equipment and establishing a temporary site office. A break area will be set up outside of regulated work areas. Mobilization may involve clearing areas for the SZ and CRZ. During this initial phase, project personnel will walk the site to confirm the existence of anticipated hazards and identify safety and health issues that may have arisen since the writing of this plan.

Hazard Identification

The hazards of this phase of activity are associated with heavy equipment operation, manual materials handling, installation of temporary on-site facilities, and manual site preparation.

Manual materials handling and manual site preparation may cause blisters, sore muscles, and joint and skeletal injuries; and may present eye, contusion, and laceration hazards. Installation of temporary field office and support facilities may expose personnel to electrical hazards, underground and overhead utilities, and physical injury due to the manual lifting and moving of materials. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Environmental hazards include plants, such as poison ivy and poison oak; aggressive fauna, such as ticks, fleas, mosquitoes, wasps, spiders, and snakes; weather, such as sunburn, lightning, rain, and heat- or cold-related illnesses; and pathogens, such as rabies, Lyme disease, and blood-borne pathogens.

Controls

Control procedures for these hazards are discussed in Section 8.0, General Safety Practices.

9.2.2 Demolition/Site Clearing

Description of Tasks

Site clearance will involve manual or mechanical removal of objects impeding access to the construction footprint. These obstructions are both natural and man-made items

and will include, but not be limited to, fabricated metal and concrete structures, trees, vegetation rubble, and miscellaneous trash/debris.

Hazard Identification

Hazards associated with demolition and site clearance include personnel working in and around potentially unstable structures, or locations of potential contact with hazardous chemicals, utilities, and/or falling objects. This task will involve manual, as well as mechanical demolition/clearance efforts so exertion and equipment hazards exist.

Controls

PPE – Personnel shall be protected from hazards of irritant and toxic plants and suitably instructed in the first aid treatment available.

Preparatory Operations – Prior to permitting employees to start demolition operations, an engineering survey shall be made, by a licensed Professional Engineer, of the structure to determine the stability of the structure. Any adjacent structure shall where personnel may be exposed shall also be similarly checked. The PO shall have in writing evidence that such a survey has been performed. All structural instabilities shall be shored or braced, under the supervision of a licensed Professional Engineer, prior to access by an FP.

Utilities – All electric, gas, water, steam, sewer, and other service lines shall be shut off, capped, or otherwise controlled, outside the building line before demolition work is started. In each case, any utility company that is involved shall be notified in advance. If it is necessary to maintain any power, water or other utilities during demolition, such lines shall be temporarily relocated, as necessary.

Hazardous Substances – It shall also be determined if any type of hazardous chemicals, gases, explosives, flammable materials, or similarly dangerous substances have been used in any pipes, tanks, or other equipment on the property. When the presence of any such substances is apparent or suspected, testing and purging shall be performed and the hazard eliminated before demolition is started.

Falling Debris/Objects – No material shall be dropped to any point lying outside the exterior walls of the structure unless the area is effectively protected. Access to the area where falling objects/debris may be encountered must be gated and controlled.

Structural Collapse – Structural or load supporting members on any floor shall not be cut or removed until all stories above such a floor have been demolished and removed. Walls, which are to serve as retaining walls against which debris will be piled, shall not be so used unless capable of safely supporting the imposed load. Mechanical equipment shall not be used on floors or working surfaces unless such floors or surfaces are not of sufficient strength to support the imposed load.

Rollover Guards – All equipment used in site clearing operations shall be equipped with rollover guards meeting the applicable requirements. In addition, rider-operated equipment shall be equipped with an overhead and rear canopy guard meeting the applicable requirements.

Inspections – During demolition, continuing inspections by a licensed Professional Engineer shall be made as the work progresses to detect hazards resulting from weakened or deteriorated floors, walls, or loosened material. No FP shall be permitted to work where such hazards exist until they are corrected by shoring, bracing, or other effective means.

9.2.3 Excavation and Cut/Fill Operations

9.2.3.1 Excavation/Trenching

Description of Tasks

This task includes the excavation of contaminated soils and superficial debris. Excavation depths vary across the site.

Hazard Identification

The hazards of this activity are associated with heavy equipment operation, subsurface intrusion, manual materials handling, stockpiling, and disposal. Subsurface intrusion presents hazards associated with negotiating buried utilities, cave-ins of the excavated areas, and regress methods for personnel working inside the excavated areas. Disruption of contaminated soil also presents a health hazard.

Controls

Underground Utilities – The estimated locations of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during the excavation work, shall be determined prior to opening an excavation. Utility companies or owners shall be contacted (“Call Before You Dig”) within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations prior to the start of actual excavation.

When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means. While the excavation is open, underground installations shall be protected, supported, or removed, as necessary, to safeguard site personnel.

Cave-Ins – Project personnel in an excavation shall be protected from cave-ins by an adequate protective system, except when:

- Excavations are made entirely in stable rock or excavations are less than five feet in depth and examination of the ground by the SSO provides no indication of a potential cave-in.
- Protective systems shall have the capacity to resist, without failure, all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

Project personnel shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least two feet from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

Daily inspections of excavations, the adjacent areas, and protective systems shall be made by the SSO for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the SSO prior to the start of work and as needed throughout operations. Inspections shall also be made after every rainstorm or other hazard-increasing occurrence. These inspections are only required when project personnel exposure can be reasonably anticipated.

Where the SSO finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed personnel shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

Excavation Egress – A stairway, ladder, ramp, or other safe means of egress shall be located in trench excavations that are four feet or more in depth so as to require no more than 25 feet or lateral travel for project personnel.

9.2.3.2 Heavy Equipment Operation

Description of Tasks

Heavy equipment to be used for this task include, but are not limited to, excavators, dozers, dump trucks, and water sprayers (if required).

Hazard Identification

The most common type of accident that occurs in material handling operations is the “caught between” situation when a load is being handled and an object gets caught between two moving parts of the equipment. Operation of the heavy construction equipment may produce harmful noise.

Controls

Equipment Inspection – All vehicles in use shall be checked prior to operation to ensure that all parts, equipment, and accessories that affect safe operations are in proper operating condition and free from defects. All defects shall be corrected before the vehicle is placed in service.

Ground Guides – No personnel shall use any motor vehicle, earthmoving, or compacting equipment having an obstructed view to the rear, unless:

- The vehicle has a reverse signal alarm distinguishable from the surrounding noise level; or
- The vehicle is backed up only when an observer signals that it is safe to do so.

Blocking – Heavy machinery, equipment, or parts thereof that are suspended or held aloft shall be substantially blocked to prevent falling or shifting before employees are permitted to work under or between them.

Noise – Control measures for noise are addressed in **Section 5.2**.

Traffic – Control measures for traffic are addressed in **Section 8.17**.

9.2.3.3 Disturbance/Handling of Contaminated Material

Description of Tasks

After the contaminated soil is excavated from below the Site’s surface, the material will be stockpiled, dried, and either transported offsite or relocated and backfilled on site.

Hazard Identification

The hazards associated with materials handling include contact of the contaminated material with project personnel, or cross contamination with other site soil.

Controls

Cross Contamination – Following excavation, contaminated soil stockpiles will be placed on a structure constructed to separate the material from the site soil and collect any groundwater leachate. The material shall be covered to prevent storm water erosion or migration of contaminants through storm water.

Air Monitoring – Air and particulate monitoring will be conducted during soil excavation activities to assess the potential for exposure to airborne COCs. If the results of air monitoring indicate the presence of organic vapors or particulates in a concentration causing concern, personnel will upgrade to Level C protection. Refer to Section 5.1, Air Monitoring, for a description of air monitoring requirements and action levels. A description of each level of personal protection is included in Section 4.0, Personal Protective Equipment.

Traffic – Control measures for traffic are addressed in Section 8.17.

9.2.4 Drilling/Subsurface Intrusion Activities

Description of Tasks

This component of work includes the project tasks of remediation of historic fill and impacted soil, and installation of a permeable reactive barrier.

Hazard Identification

The primary physical hazards for this activity are associated with the use of soil boring and grouting equipment. The equipment is hydraulically powered and uses static force and dynamic percussion force to advance sampling and penetrating tubes.

Accidents can occur as a result of improperly placing the equipment on uneven or unstable terrain or failing to adequately secure the equipment prior to the start of operations. Overhead utility lines can create hazardous conditions if contacted by the equipment. Underground installations such as electrical lines, conduit, and product lines pose a significant hazard if contacted.

Controls

Geoprobe and Drill Rig Safety Procedures - The operator of the equipment must possess required state or local licenses to perform such work. All members of the crew shall receive site-specific training prior to beginning work.

The operator is responsible for the safe operation of the rig, as well as the crew's adherence to the requirements of this HASP. The operator must ensure that all safety equipment is in proper condition and is properly used. The members of the crew must follow all instructions of the operator, wear all personal protective equipment, and be aware of all hazards and control procedures. The operator and crew must participate in the Daily Safety Meetings and be aware of all emergency procedures.

Equipment Inspection - Each day, prior to the start of work, the rig and associated equipment must be inspected by the operator. The following items must be inspected:

- Vehicle condition;
- Proper storage of equipment;
- Condition of all hydraulic lines;
- Fire extinguisher; and
- First aid kit.

Equipment Set Up - The drill rig must be properly blocked and leveled prior to raising the derrick. The wheels which remain on the ground must be chocked. The leveling jacks shall not be raised until the derrick is lowered. The rig shall be moved only after the derrick has been lowered.

All well sites will be inspected by the driller prior to the location of the rig to verify a stable surface exists. This is especially important in areas where soft, unstable terrain is common.

The drill rig must be properly blocked and leveled prior to raising the derrick. Blocking provides a more stable drilling structure by evenly distributing the weight of the rig. Proper blocking ensures that differential settling of the rig does not occur.

When the ground surface is soft or otherwise unstable, wooden blocks, at least 24" by 24" and 4" to 8" thick shall be placed between the jack swivels and the ground. The emergency brake shall be engaged, and the wheels that are on the ground shall be chocked.

Rules for Intrusive Activity - Before beginning any intrusive activity, the existence and location of underground pipe, conduit, electrical equipment, and other installations will be determined. This will be done, if possible, by contacting the appropriate client representative to mark the location of the lines. "Call Before You Dig" will verify the potential for encountering subsurface utilities. If the client's knowledge of the area is incomplete, an appropriate device, such as a magnetometer, will be used to locate the line.

Combustible gas readings of the general work area will be made regularly in areas where and/or during operations when the presence of flammable vapors or gases is suspected, such as during intrusive activities (see Section 5.1). Operations must be suspended and corrective action taken if the airborne flammable concentration reaches 10% of the LEL in the immediate area (a one-foot radius) of the point of drilling, or near any other ignition sources.

Overhead Electrical Clearances - If equipment is operated in the vicinity of overhead power lines, the power to the lines must be shut off or the equipment must be positioned and blocked such that no part, including cables, can come within the minimum clearances as follows:

Nominal Voltage	System	Minimum Clearance	Required
0-50kV		10 feet	
51-100kV		12 feet	
101-200kV		15 feet	
201-300kV		20 feet	
301-500kV		25 feet	
501-750kV		35 feet	
751-1,000kV		45 feet	

When the drill rig is in transit, with the boom lowered and no load, the equipment clearance must be at least 4 feet for voltages less than 50kV, 10 feet for voltages of 50 kV to 345 kV, and 16 feet for voltages above 345 kV.

Hoisting Operations - Drillers should never engage the rotary clutch without watching the rotary table, and ensuring it is clear of personnel and equipment.

Unless the drawworks is equipped with an automatic feed control, the brake should not be left unattended without first being tied down.

Drill pipe, auger strings or casing should be picked up slowly. Drill pipe should not be hoisted until the driller is sure that the pipe is latched in the elevator, or the derrickman has signaled that he may safely hoist the pipe.

During instances of unusual loading of the derrick or mast, such as when making an unusually hard pull, only the driller should be on the rig floor; no one else should be on the rig or derrick.

The brakes on the drawworks of the drill rig should be tested by the driller each day. The brakes should be thoroughly inspected by a competent individual each week.

A hoisting line with a load imposed should not be permitted to be in direct contact with any derrick member or stationary equipment, unless it has been specifically designed for line contact.

Workers should never stand near the borehole whenever any wire line device is being run. Hoisting control stations should be kept clean and controls labeled as to their functions.

Catline Operations - Only experienced workers will be allowed to operate the cathead controls. The kill switch must be clearly labeled and operational prior to operation of the catline. The cathead area must be kept free of obstructions and entanglements.

The operator should not use more wraps than necessary to pick up the load. More than one layer of wrapping is not permitted.

Personnel should not stand near, step over, or go under a cable or catline which is under tension.

Employees rigging loads on catlines shall:

- Keep out from under the load;
- Keep fingers and feet where they will not be crushed;
- Be sure to signal clearly when the load is being picked;
- Use standard visual signals only and not depend on shouting to coworkers; and
- Make sure the load is properly rigged, since a sudden jerk in the catline will shift or drop the load.

Wire Rope - When two wires are broken or rust or corrosion is found adjacent to a socket or end fitting, the wire rope shall be removed from service or re-socketed. Special attention shall be given to the inspection of end fittings on boom support, pendants, and guy ropes.

Wire rope removed from service due to defects shall be cut up or plainly marked as being unfit for further use as rigging.

Wire rope clips attached with U-bolts shall have the U-bolts on the dead or short end of the rope; the clip nuts shall be re-tightened immediately after initial load carrying use and at frequent intervals thereafter.

When a wedge socket fastening is used, the dead or short end of the wire rope shall have a clip attached to it or looped back and secured to itself by a clip; the clip shall not be attached directly to the live end.

Protruding ends of strands in splices on slings and bridles shall be covered or blunted. Except for eye splices in the ends of wires and for endless wire rope slings, wire rope used in hoisting, lowering, or pulling loads, shall consist of one continuous piece without knot or splice.

An eye splice made in any wire rope shall have not less than five full tucks.

Wire rope shall not be secured by knots. Wire rope clips shall not be used to splice rope. Eyes in wire rope bridles, slings, or bull wires shall not be formed by wire clips or knots.

Pipe/Auger Handling - Pipe and auger sections shall be transported by cart or carried by two persons. Individuals should not carry auger or pipe sections without assistance.

Workers should not be permitted on top of the load during loading, unloading, or transferring of pipe or rolling stock.

Employees should be instructed never to try to stop rolling pipe or casing; they should be instructed to stand clear of rolling pipe.

Slip handles should be used to lift and move slips. Employees are not permitted to kick slips into position.

When pipe is being hoisted, personnel should not stand where the bottom end of the pipe could whip and strike them.

Pipe and augers stored in racks, catwalks or on flatbed trucks should be secured to prevent rolling.

9.2.5 Subsurface Chemical Sample Collection/Analysis

Description of Tasks

This sub-task consists of the collection of soil samples for subsequent field and laboratory analysis. The physical hazards of soil sampling are primarily associated with the sample collection methods, procedures utilized, and the environment itself.

Hazard Identification

Incidental contact with COCs is the primary hazard associated with sampling the stabilized material. This contact may occur through the manipulation of sample media and equipment, manual transfer of media into sample containers, and proximity of operations to the breathing zone. The primary hazards associated with these sampling procedures are not potentially serious; however, other operations in the area, or the conditions under which samples must be collected, may present chemical and physical hazards. The hazards directly associated with sampling procedures are generally limited to strains/sprains and potential eye hazards. Potential chemical hazards may include contact with media containing site COCs and potential contact with chemicals used for equipment decontamination.

Controls

PPE – To control dermal exposure during sampling activities, a minimum of Level D protection will be worn. If necessary, based on field observations and site conditions, air monitoring may be conducted during sediment sampling activities. If the results of air monitoring indicate the presence of airborne contaminants in a concentration causing concern, personnel will upgrade to Level C protection. Refer to Section 5.1, Air Monitoring, for a description of air monitoring requirements and action levels. A description of each level of personal protection is included in Section 4.0, Personal Protective Equipment.

9.2.6 UST Closure

9.2.6.1 Working in Confined Spaces

Description of Tasks

The project will involve the excavation of historic fill material. It may also involve the closure of USTs.

Hazard Identification

Soil excavation activities may require the entrance into confined spaces to facilitate cleaning and removal of the USTs.

Controls

All personnel required to enter into confined or enclosed spaces must be instructed as to the nature of the hazards involved, the necessary precautions to be taken, and in the use of required protective and emergency equipment. The PO shall comply with all specific regulations that apply to work in dangerous or potentially dangerous areas.

9.2.6.2 Working with Compressed Air

Description of Tasks

The proposed method of purging the USTs includes the injection of compressed gas into the tank and attached piping network.

Hazard Identification

Uncontrolled release of the highly pressured air can cause injury to FP during this task. Cylinders must also be properly managed to ensure they are not compromised during storage and/or use.

Controls

Pressure Regulation – Compressed air used for cleaning purposes shall be reduced to less than 30 pounds per square inch and then only with effective chip guarding and personal protective equipment.

Cylinder Storage – Valve protection caps shall be in place and secured when compressed gas cylinders are transported, moved, or stored. Cylinder valves shall be closed when work is finished and when cylinders are empty or are moved. Compressed gas cylinders shall be secured in an upright position at all times, except if necessary for short periods of time when cylinders are actually being hoisted or carried. Cylinders shall be placed in a location where they cannot become part of an electrical circuit.

9.2. Decontamination

All equipment will be decontaminated before leaving the site. Personnel involved in decontamination activities may be inadvertently exposed to skin contact with contaminated

materials and chemicals brought from the EZ. Personnel involved in decontamination activities must wear PPE that is, at a minimum, one level below the level worn by personnel working in the EZ.

9.2. Demobilization

Demobilization involves the removal of all tools, equipment, supplies, and vehicles brought to the site. The hazards of this phase of activity are associated with heavy equipment operation and manual materials handling.

Manual materials handling may cause blisters, sore muscles, and joint and skeletal injuries; and may present eye, contusion, and laceration hazards. Heavy equipment operation presents noise and vibration hazards, and hot surfaces, to operators. Personnel in the vicinity of heavy equipment operation may be exposed to physical hazards resulting in fractures, contusions, and lacerations and may be exposed to high noise levels. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Environmental hazards include plants, such as poison ivy and poison oak; aggressive fauna, such as ticks, fleas, mosquitoes, wasps, spiders, and snakes; weather, such as sunburn, lightning, rain, and heat-or cold-related illnesses; and pathogens, such as rabies, Lyme disease, and blood-borne pathogens.

Control procedures for these hazards are discussed in Section 8.0, General Safety Practices.

9.3 Chemical Hazards

The chemical hazards associated with site operations are related to inhalation, ingestion, and skin exposure to site COCs. Concentrations of airborne COCs during site tasks may be measurable and will require air monitoring during certain operations. Air monitoring requirements for site tasks are outlined in Section 5.1.

COCs at the site include heavy metals, some VOC compounds, some SVOC compounds and potentially other industrial chemicals including PCBs and pesticides.

The potential for inhalation of site COCs is low. The potential for dermal contact with soils containing site COCs during remedial operations is moderate. **Table 6**, below lists the primary contaminants that have been identified at the Site and the media in which they are present.

Table 6 – List of Primary Contaminants

Media: Soil		
Semi-Volatile Organic Compounds	Highest Concentration Previously Detected Units = mg/kg	Applicable Monitoring Instrument
Benzo(a)anthracene	36	PID
Benzo(a)pyrene	28	PID
Benzo(b)fluoranthene	34	PID
Benzo(k)fluoranthene	12	PID

Chrysene	36	PID
Dibenzo(a,h)anthracene	4.3	PID
Indeno(1,2,3-cd)pyrene	15	PID
Metals	Highest Concentration Previously Detected Units = mg/kg	Applicable Monitoring Instrument
Arsenic	15.5	NA
Barium	2540	NA
Cadmium	11.6	NA
Copper	38200	NA
Lead	20800	NA
Mercury	8.2	NA
Nickel	90	NA
Zinc	4310	NA
Pesticides	Highest Concentration Previously Detected Units = mg/kg	Applicable Monitoring Instrument
4,4'-DDD	0.25	NA
4,4'-DDE	0.2	NA
4,4'-DDT	0.96	NA
Dieldrin	0.093	NA
Total PCBs	Highest Concentration Previously Detected Units = mg/kg	Applicable Monitoring Instrument
Total PCBs	0.5	NA

Media: Groundwater		
Volatile Organic Compounds	Highest Concentration Previously Detected Units = µg/L	Applicable Monitoring Instrument
1,2-Dibromoethane	0.5	PID
Chloroform	36	PID
Styrene	21	PID
Tetrachloroethene	67	PID
Metals	Highest Concentration Previously Detected Units = µg/L	Applicable Monitoring Instrument
Iron	3510	NA
Manganese	1340	NA
Sodium	185000	NA

Media: Soil Vapor		
Volatile Organic Compounds	Highest Concentration Previously Detected Units = $\mu\text{g}/\text{m}^3$	Applicable Monitoring Instrument
Trichloroethene	400	PID

10.0 EMERGENCY PROCEDURES

10.1 General

Prior to the start of operations, the work area will be evaluated for the potential for fire, contaminant release, or other catastrophic event. Unusual conditions or events, activities, chemicals, and conditions will be reported to the FS/SSO immediately.

The FS/SSO will establish evacuation routes and assembly areas for the site. All personnel entering the site will be informed of this route and the assembly area.

10.2 Emergency Response

If an incident occurs, the following steps will be taken:

- The FS/SSO will evaluate the incident and assess the need for assistance and/or evacuation;
- The FS/SSO will call for outside assistance as needed;
- The FS/SSO will ensure the PM is notified promptly of the incident; and
- The FS/SSO will take appropriate measures to stabilize the incident scene.

10.2.1 Fire

In the case of a fire at the site, the FS/SSO will assess the situation and direct fire-fighting activities. The FS/SSO will ensure that the PM is immediately notified of any fires. Site personnel will attempt to extinguish the fire with available extinguishers, if safe to do so. In the event of a fire that site personnel are unable to safely extinguish with one fire extinguisher, the local fire department will be summoned.

10.2.2 Contaminant Release

In the event of a contaminant release, the following steps will be taken:

- Notify FS/SSO immediately;
- Evacuate immediate area of release;
- Conduct air monitoring to determine needed level of PPE; and
- Don required level of PPE and prepare to implement control procedures.

The FS/SSO has the authority to commit resources as needed to contain and control released material and to prevent its spread to off-site areas.

10.3 Medical Emergency

All employee injuries must be promptly reported to the SSO/FS, who will:

- Ensure that the injured employee receives prompt first aid and medical attention;
- In emergency situations, the worker is to be transported by appropriate means to the nearest urgent care facility (normally a hospital emergency room); and
- If the injured person is a SESI employee, notify SESI at 973-808-9050.

10.3.1 Emergency Care Steps

Survey the scene. Determine if it is safe to proceed. Try to determine if the conditions that caused the incident are still a threat. Protect yourself from exposure before attempting to rescue the victim.

- Do a primary survey of the victim. Check for airway obstruction, breathing, and pulse. Assess likely routes of chemical exposure by examining the eyes, mouth, nose, and skin of the victim for symptoms.
- Phone Emergency Medical Services (EMS). Give the location, telephone number used, caller's name, what happened, number of victims, victim's condition, and help being given.
- Maintain airway and perform rescue breathing as necessary.
- Perform CPR as necessary.
- Do a secondary survey of the victim. Check vital signs and do a head-to-toe exam.

Treat other conditions as necessary. If the victim can be moved, take him/her to a location away from the work area where EMS can gain access.

10.4 First Aid - General

All persons must report any injury or illness to their immediate supervisor or the FS. Trained personnel will provide first aid. Injuries and illnesses requiring medical treatment must be documented. The FS and SSO must fill out an accident/incident report as soon as emergency conditions no longer exist and first aid and/or medical treatment has been ensured. The report must be completed and submitted to the PM within 24 hours after the incident.

If first-aid treatment is required, first aid kits are kept at the CRZ. If treatment beyond first aid is required, the injured person(s) should be transported to the medical facility. If the injured person is not ambulatory or shows any sign of not being in a comfortable and stable condition for transport, then an ambulance/paramedics should be summoned. If there is any doubt as to the injured worker's condition, it is best to let the local paramedic or ambulance service examine and transport the worker.

10.4.1 First Aid - Inhalation

Any employee complaining of symptoms of chemical overexposure as described in Section 4, General Site Safety Procedures, will be removed from the work area and transported to the designated medical facility for examination and treatment.

10.4.2 First Aid - Ingestion

Call EMS and consult a poison control center for advice. If available, refer to the MSDS for treatment information. If the victim is unconscious, keep them on their side and clear the airway if vomiting occurs.

10.4.3 First Aid - Skin Contact

Project personnel who have had skin contact with contaminants will, unless the contact is severe, proceed through the CRZ, to the wash area. Personnel will remove any contaminated clothing, and then flush the affected area with water for at least 15 minutes. The worker should be transported to the medical facility if he/she shows any sign of skin reddening, irritation, or if he/she requests a medical examination.

10.4.4 First Aid - Eye Contact

Project personnel who have had contaminants splashed in their eyes or who have experienced eye irritation while in the EZ, must immediately proceed to the eyewash station in the CRZ. Do not decontaminate prior to using the eyewash. Remove whatever protective clothing is necessary to use the eyewash. Flush the eye with clean running water for at least 15 minutes. Arrange prompt transport to the designated medical facility.

10.5 Reporting Injuries, Illnesses, and Safety Incidents

Injuries and illnesses, however minor, will be reported to the FS immediately. The FS will complete an injury report and submit it to the HSM, and the PM by end of shift.

10.6 Emergency Information

The means to summon local public response agencies such as police, fire, and ambulance will be reviewed in the daily safety meeting. These agencies are identified in **Table 7**, below.

Table 7 – Emergency Contacts

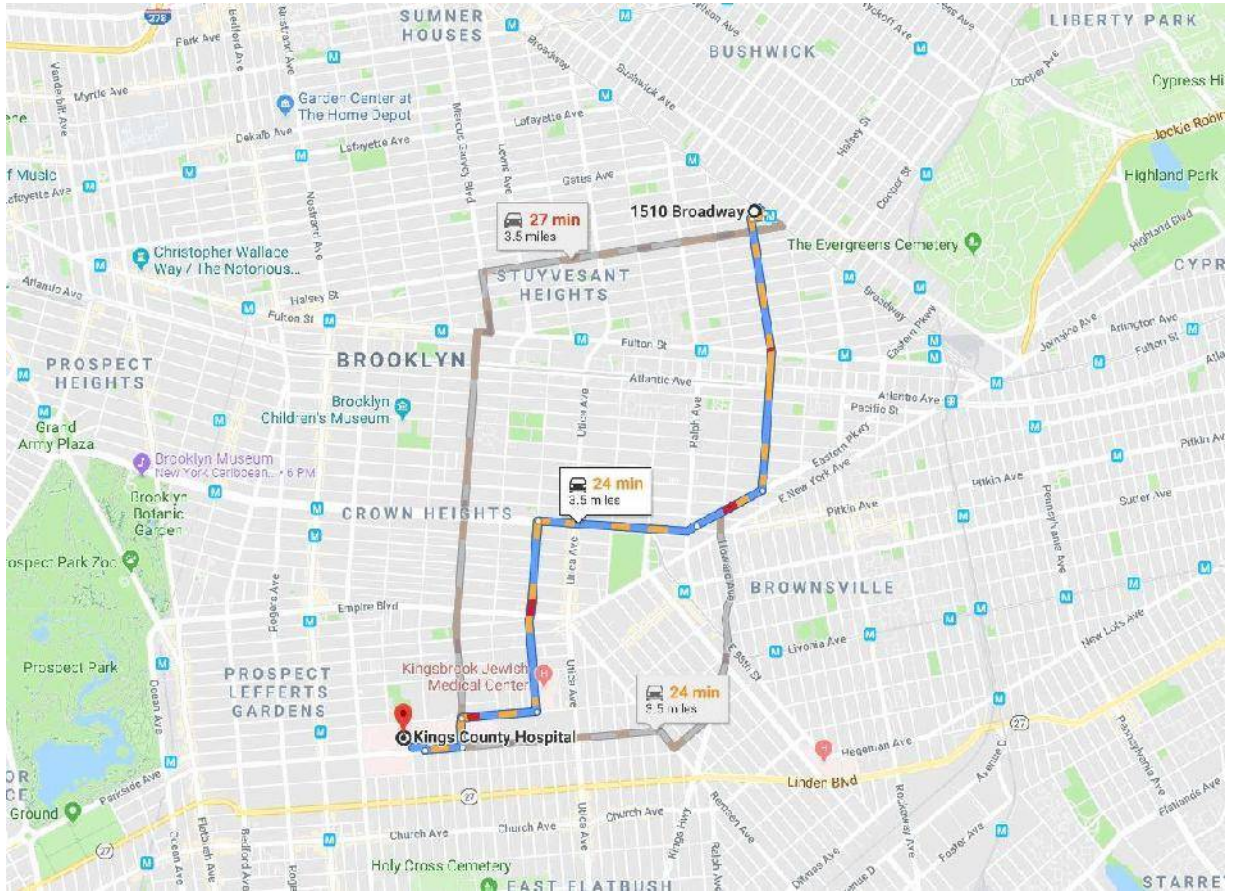
Local Emergency Contacts	Telephone No.
EMERGENCY	911
Kings County Hospital	(718) 245-3131
Police Emergency	911
Rescue Squad	911
Ambulance	911
Miscellaneous Contacts	Telephone No.
N.Y. Poison Control Center	(800) 222-1222
National Response Center and Terrorist Hotline	(800) 424-8802
Center for Disease Control	(800) 311-3435
Utility Mark-Out	(800) 962-7962

10.6.1 Directions to Hospital

Mount Sinai Hospital
 451 Clarkson Avenue,
 Brooklyn, New York 11203
 (718) 245-3131

Directions to Hospital:

Head southeast on Broadway toward Hancock St
 Turn right onto Saratoga Avenue to Eastern Parkway
 Turn right onto Eastern Parkway to Dr. Wesley MacDonald Holder Avenue/Schenectady Ave
 Turn right onto Clarkson Avenue
 Turn right onto East 38th Street
 Hospital will be on the right



11.0 LOGS, REPORTS, AND RECORD KEEPING

The following is a summary of required health and safety logs, reports, and record keeping for the operations at the subject site.

11.1 HASP Field Change Request

To be completed for initiating a change to the HASP. PM approval is required. The original will be kept in the project file (See Attachment 3).

11.2 Medical and Training Records

The HSM must obtain and keep a log of personnel meeting appropriate training and medical qualifications for the site work. The log will be kept in the project file. Each company's Human Resources Department will maintain medical records, in accordance with 29 CFR 1910.1020.

11.3 Exposure Records

Any personnel monitoring results, laboratory reports, calculations, and air sampling data sheets are part of an employee exposure record. These records will be kept in accordance with 29 CFR 1910.1020. For SESI employees, the originals will be sent to the Human Resources Manager. For subcontractor employees, the original file will be sent to the subcontractor employer with a copy maintained in the SESI project file.

11.4 Accident/Incident Report

Any accident/incident reports must be completed following procedures given in Section 10.5 of this HASP. The originals will be sent to the HSM for maintenance. A copy of the forms will be kept in the project file. (See Attachment 4)

11.5 OSHA Form 200

An OSHA Form 200 (Log of Occupational Injuries and Illnesses) will be kept at the project site. All recordable injuries or illnesses will be recorded on this form. At the end of the project, the original will be sent to the Human Resources Manager for maintenance. Subcontractor employees must also meet the requirements of maintaining an OSHA 200 Form. The accident/incident report meets the requirements of the OSHA Form 101 (Supplemental Record), which must be maintained with the OSHA Form 200 for all recordable injuries or illnesses.

11.6 On-Site Health and Safety Field Logbooks

The HSM or designee will maintain an on-site health and safety log book in which daily Site conditions, activities, personnel, and significant events will be recorded. Calibration records and personnel monitoring results, if available, will also be recorded in the field logbook. The original logbook will be kept in the project file.

Whenever any personnel monitoring is conducted onsite, the monitoring results will be noted in the filed logbook. These will become part of the exposure records file and will be maintained by the HSM.

A signatory page is included (See Attachment 5) and is to be signed by those working on and/or visiting the site.

11.7 Material Safety Data Sheets

Material Safety Data Sheets (MSDS) will be obtained and kept on file at the project site for each hazardous chemical brought to, use, or stored at the Site (See Attachment 6).

12.0 COVID-19 RESPONSE ACTION PLAN

SESI is concerned with the safety and well-being of its employees, vendors, subcontractors, and others with access to its offices and job sites, with particular emphasis on the unique challenges posed by COVID-19.

SESI has established the following protocols in keeping with the recommendations of the CDC and other sources including State Governor Executive Orders for work taking place on construction sites.

We request that all SESI employees, vendors, and subcontractors help with our prevention efforts while at work.

In order to minimize the spread of COVID-19, we must all cooperate in doing the following:

- Frequently wash your hands with soap and water for at least 20 seconds. When soap and running water are unavailable, use an alcohol-based hand rub with at least 60% alcohol. Always wash hands that are visibly soiled.
- Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow.
- Discourage handshaking, avoid touching your eyes, nose, or mouth with unwashed hands.
- Limit the sharing of tools, machinery, equipment, phones, desks, and computers.
- Wear cloth face coverings on all construction sites.

- Avoid close contact with people who are sick.
- Employees who have symptoms (i.e., fever, cough, or shortness of breath) should notify their supervisor and stay home—**DO NOT GO TO WORK**.
- Sick employees should follow CDC-recommended steps. Employees should not return to work until the criteria to discontinue home isolation are met, in consultation with healthcare providers and state and local health departments.

The following are the specific jobsite protocols and response actions to be taken in the event someone on site has been in contact with, or has themselves, the COVID-19 virus:

OFFICE/JBSITE PROTOCOL

- If an employee/worker exhibits COVID-19 symptoms, the employee/worker must remain at home until he or she is symptom free for 72 hours (3 full days) without the use of fever-reducing or other symptom-altering medicines (e.g. acetaminophen, cough suppressants). SESI will similarly require an employee or worker that reports to work with symptoms to return home until they are symptom free for 72 hours (3 full days).
- Limit person to person contact, and when unavoidable, maintain CDC distancing guidelines.
- Avoid eating lunch in groups.
- Avoid in-person meetings if possible. If an in-person meeting is necessary, conduct it in a well-ventilated area with enough space for attendees to distance themselves from one another. Field jobsite meetings should be conducted in smaller group meetings (no more than 5 persons when possible) versus one large meeting.
- Only workers necessary to the execution of the work should be at the jobsites. No non-essential visitors should be permitted at the worksite.

RESPONSE ACTION TRIGGER EVENTS:

- an employee/worker at work has tested positive for COVID-19
- an employee/worker at work has suspected, but unconfirmed, case of COVID-19
- an employee/worker self-reported that they came in contact with someone who had a presumptive positive case of COVID-19

- an employee/worker has been exposed to the virus but only found out after they have interacted with others

RESPONSE ACTIONS:

- Upon occurrence of any of the Trigger Events above, employees/subcontractors shall notify SESI Management about the suspected employee/worker infected with, or exposed to, COVID-19.
- SESI Management will investigate the incident to confirm the report is valid.
- Employees/Subcontractors shall investigate their respective infected employee(s) and report the following to SESI Management and HR:
 - Identify all individuals who worked in proximity (six feet) of the infected employee/worker,
 - Employee(s)/Worker(s) infected with the COVID-19 virus, and employee(s)/worker(s) that came in contact with the infected employee/worker shall be sent home for a period of 14 days,
 - Do not identify the infected employee/worker by name to avoid violation of privacy/confidentiality laws, and,
 - Keep SESI Management informed of progress and updates.
- If an infected person was in the office, SESI will clean and disinfect common areas and surfaces, in accordance with CDC recommendations.
- SESI Management will notify affected employees/workers of the Trigger Event and instruct them to take the response actions above.
- **SESI Management policy requires written documentation from a health care professional, that confirmed infected employees can return to work.**

Except for circumstances in which SESI is legally required to report workplace occurrences of communicable disease, the confidentiality of all medical conditions will be maintained in accordance with applicable law and to the extent practical under the circumstances. When required, the number of persons who will be informed of an employee's/worker's condition will be kept at the minimum needed to appropriately notify other potentially affected employees/workers of Trigger Events and to attempt to minimize the potential for transmission of the virus.

ATTACHMENT 1

**AIR MONITOR
LOG**

ATTACHMENT 2

OSHA POSTER

Job Safety and Health

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Occupational Safety
and Health Administration
U.S. Department of Labor

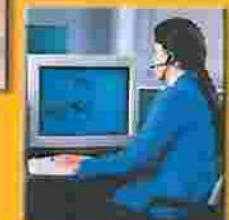
EMPLOYEES:

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in that inspection.
- You can file a complaint with OSHA within 30 days of retaliation or discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have the right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violations.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records and records of your exposures to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.
- You must comply with all occupational safety and health standards issued under the *OSH Act* that apply to your own actions and conduct on the job.

EMPLOYERS:

- You must furnish your employees a place of employment free from recognized hazards.
- You must comply with the occupational safety and health standards issued under the *OSH Act*.

This free poster available from OSHA –
The Best Resource for Safety and Health



Free assistance in identifying and correcting hazards or complying with standards is available to employers, without citation or penalty, through OSHA-supported Consultation programs in each state.

1-800-321-OSHA (6742)
www.osha.gov

OSHA 3185-12 2005



ATTACHMENT 3
HASP FIELD CHANGE REQUEST FORM

HEALTH & SAFETY PLAN CHANGE NOTICE

Pages ____ of ____

Project: _____ H&S-CN

1) HASP VERSION: _____ SECTION: _____ PAGE (s): _____

RE: --- Change to existing HASP Anticipated Revision Date: _____

--- Addition to existing HASP

--- Other: _____

_____ CONT. _____

2) PROPOSED CHANGE: _____

3) REASON FOR PROPOSED CHANGE(s):

--- Required by SPEC or Change Order --- Other: _____

--- Disposition of Deficiency _____ CONT. _____

--- Change in Regulatory or Other Requirements

--- Operational Experience

4) EXHIBITS ATTACHED ____ NO ____ YES (If YES, describe) _____

_____ CONT. _____

5) PMK APPROVALS PROJECT MANAGER: _____ Date: _____

SITE MANAGER: _____ Date: _____

H&S MANAGER: _____ Date: _____

Client Approval Required: ____ NO ____ YES (If YES, date submitted) _____

6) CLIENT APPROVAL ____ APPROVED ____ REMANDED ____ REJECTED

Comments: _____

_____ CONT. _____

Client Representative: _____ Date: _____

7) DISTRIBUTION AFTER APPROVAL

HASP UPDATE LIST --- OTHER: _____

CLIENT _____

PROJECT FILES _____

8) PREPARED BY: _____ Date: _____

Title: _____

ATTACHMENT 4
INCIDENT REPORT

Summary of Work-Related Injuries and Illnesses

All establishments covered by Part 1924 must complete this Summary page, even if no work-related injuries or illnesses occurred during the year. Refer back to review the Log to verify that the entries are complete and accurate before completing this summary.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the Log. If you had no cases, write "0."

Number of Cases

Total number of deaths _____ Total number of cases with days away from work _____ Total number of transfer or restriction cases _____ Total number of other recordable cases _____

(g) _____

Number of Days

Total number of days away from work _____ Total number of days of job transfer or restriction _____

(k) _____

Injury and Illness Types

Total number of... (M) _____
 Injuries _____ (a) Poisonings _____
 (2) Skin disorders _____ (c) Hearing loss _____
 (3) Respiratory conditions _____ (d) All other illnesses _____

Post this Summary page from February 1 to April 30 of the year following the year covered by the form.

Underpinning this form is the collection of information submitted to OSHA's reporting system, including, but not limited to, the Incident Log, which is available on the OSHA website, and the data entered and reviewed by OSHA's data collection system. Please refer to the collection of information when it displays a currently valid OSHA control number. If you have any comments about these procedures or any other aspects of the data collection, contact the OSHA Office of Statistical Analysis, Room N-3014, 200 Constitution Avenue, NW, Washington, DC 20540. Do not send the completed forms to this office.

Establishment Information

Your establishment name _____

..... ZIP _____

Industry description (e.g., Manufacturer of motor truck engines)

Standard Industrial Classification (SIC), Frowned (e.g., 37-2)

OE _____

North American Industrial Classification (NAICS), Frowned (e.g., 336212)

Employment information (If you don't have this figure, use the figure on the back of this page to estimate.)
 Annual average number of employees _____
 Total hours worked by all employees last year _____

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

 Title _____
 Date _____

ATTACHMENT 5
SIGNATORY PAGE

Attachment 4 – Site-Specific Health and Safety Orientation Signatory Page
HEALTH AND SAFETY PLAN
1510 Broadway - Brooklyn, NY

Title	Name	Signature
Project Manager:	TBD	
Health and Safety Manager:	TBD	

I have read the attached Health and Safety Plan (HASP) and have received site-specific information and orientation regarding the identified physical, chemical, and biological hazards anticipated at this site. My signature certifies that I understand the procedures, equipment, and restrictions applicable to this project site and agree to abide by them.

Signature	Printed Name	Company	Date

ATTACHMENT 6
SAFETY DATA SHEETS

ATTACHMENT 1
AIR MONITOR LOG

Air Monitoring: Sample Collection and Analysis

Date & Time of Monitoring	Task / Operation Being	Substance(s)/ Hazard(s) Being	Monitoring Location	Type/Method of Monitoring <small>(concrete lines for</small>	Monitoring Results	Exposure Limits	Required Action

ATTACHMENT 2

OSHA POSTER

Job Safety and Health

It's the law!

OSHA[®]
Occupational Safety
and Health Administration
U.S. Department of Labor

EMPLOYEES:

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in that inspection.
- You can file a complaint with OSHA within 30 days of retaliation or discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have the right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violations.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records and records of your exposures to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.
- You must comply with all occupational safety and health standards issued under the *OSH Act* that apply to your own actions and conduct on the job.

EMPLOYERS:

- You must furnish your employees a place of employment free from recognized hazards.
- You must comply with the occupational safety and health standards issued under the *OSH Act*.

This free poster available from OSHA –
The Best Resource for Safety and Health



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1-800-321-OSHA (6742)
www.osha.gov

OSHA 3165-02 2012R



ATTACHMENT 3
HASP FIELD CHANGE REQUEST FORM

ATTACHMENT 4
INCIDENT REPORT

OSHA's Form 301 Injury and Illness Incident Report

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.



Form approved OMB no. 1218-0170

This *Injury and Illness Incident Report* is one of the first forms you must fill out when a recordable work-related injury or illness has occurred. Together with the *Log of Work-Related Injuries and Illnesses* and the accompanying *Summary*, these forms help the employer and OSHA develop a picture of the extent and severity of work-related incidents.

Within 7 calendar days after you receive information that a recordable work-related injury or illness has occurred, you must fill out this form or an equivalent. Some state workers' compensation, insurance, or other reports may be acceptable substitutes. To be considered an equivalent form, any substitute must contain all the information asked for on this form.

According to Public Law 91-596 and 29 CFR 1904, OSHA's recordkeeping rule, you must keep this form on file for 5 years following the year to which it pertains.

If you need additional copies of this form, you may photocopy and use as many as you need.

Information about the employee

- 1) Full name _____
- 2) Street _____
City _____ State _____ ZIP _____
- 3) Date of birth ____/____/____
- 4) Date hired ____/____/____
- 5) Male
 Female

Information about the case

- 10) Case number from the Log _____ (Transfer the case number from the Log after you record the case.)
- 11) Date of injury or illness ____/____/____ AM / PM
- 12) Time employee began work ____ AM / PM
- 13) Time of event ____ AM / PM Check if time cannot be determined
- 14) What was the employee doing just before the incident occurred? Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific. *Examples:* "climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry."

Information about the physician or other health care professional

- 6) Name of physician or other health care professional _____
- 7) If treatment was given away from the workplace, where was it given?
Facility _____
Street _____
City _____ State _____ ZIP _____
- 8) Was employee treated in an emergency room?
 Yes
 No
- 9) Was employee hospitalized overnight as an in-patient?
 Yes
 No

- 15) What happened? Tell us how the injury occurred. *Examples:* "When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time."
- 16) What was the injury or illness? Tell us the part of the body that was affected and how it was affected; be more specific than "hurt," "pain," or "sore." *Examples:* "strained back"; "chemical burn, hand"; "carpal tunnel syndrome."
- 17) What object or substance directly harmed the employee? *Examples:* "concrete floor"; "chlorine"; "radial arm saw." If this question does not apply to the incident, leave it blank.
- 18) If the employee died, when did death occur? Date of death ____/____/____

Completed by _____
Title _____
Phone (____) _____ Date ____/____/____

Public reporting burden for this collection of information is estimated to average 22 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Persons are not required to respond to the collection of information unless it displays a current valid OMB control number. If you have any comments about this data collection, including suggestions for reducing the burden, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3014, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Log of Work-Related Injuries and Illnesses

You must record information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12. Read the instructions on the back of this form for more information. For a complete list of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12, refer to the Occupational Safety and Health Administration's (OSHA Form 300) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Identify the person

Describe the case

(A) Case no.	(B) Employee's name	(C) Job title (e.g., <i>Welder</i>)	(D) Date of injury or onset of illness	(E) Where the event occurred (e.g., <i>Landing dock north end</i>)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g., <i>Strand dexter forms on right forearm from acetone wash</i>)
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Classify the case
CHECK ONLY ONE box for each case. Based on the most serious outcome for that case:

Enter the number of days the injured or ill worker was

Check the "Injury" column or choose one type of illness.

(G) Death	(H) Days away from work	Remained at Work			(K) Days away from work	(L) On job transfer or restriction	(M) Injury	(N) Skin disorder	(O) Respiratory condition	(P) Poisoning	(Q) Hearing loss	(R) All other illnesses
		(I)	(J)									
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Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about this estimate or any other aspect of this data collection, contact the US Department of Labor, OSHA Office of Statistical Analysis, Room N55614, 590 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Be sure to transfer these totals to the Summary Page (Form 300A) before you post it.

Page _____ of _____

- | | |
|---------------------------|--------------------------|
| (1) Injury | <input type="checkbox"/> |
| (2) Skin disorder | <input type="checkbox"/> |
| (3) Respiratory condition | <input type="checkbox"/> |
| (4) Poisoning | <input type="checkbox"/> |
| (5) Hearing loss | <input type="checkbox"/> |
| (6) All other illnesses | <input type="checkbox"/> |

Summary of Work-Related Injuries and Illnesses

All establishments covered by Part 1904 must complete this Summary page, even if no work-related injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete and accurate before completing this summary.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entire, from every page of the Log. If you had no cases, write "0."

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
(g) _____	(h) _____	(i) _____	(j) _____

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
(k) _____	(l) _____

Injury and Illness Types

Total number of ... (M)	(1) Injuries	(2) Skin disorders	(3) Respiratory conditions	(4) Poisonings	(5) Hearing loss	(6) All other illnesses
_____	_____	_____	_____	_____	_____	_____

Post this Summary page from February 1 to April 30 of the year following the year covered by the form.

Public reading version of this collection of information is estimated to average 58 minutes per response, including time to review the instructions, search and gather the data needed, and to check and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: U.S. Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20220. Do not send the completed forms to this office.

Establishment Information

Your establishment name _____
 Street _____
 City _____ State _____ ZIP _____

Industry description (e.g., *Maintenance of motor truck trailers*) _____
 Standard Industrial Classification (SIC), if known (e.g., 3775) _____
 OR
 North American Industrial Classification (NAICS), if known (e.g., 336212) _____

Employment information (If you don't have these figures, see the Worksheet on the back of this page to estimate.)
 Annual average number of employees _____
 Total hours worked by all employees last year _____

Sign here
 Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

Company name _____ Title _____
 (Signature) _____ Date _____

ATTACHMENT 5
SIGNATORY PAGE

**Attachment 4 – Site Specific Health and Safety Orientation Signatory Page
 Health and Safety Plan
 1510 Broadway, Brooklyn, New York**

Title	Name	Signature
Project Manager		
Health and Safety Manager		

I have read the attached Health and Safety Plan (HASP) and have received site-specific information and orientation regarding the identified physical, chemical, and biological hazards anticipated at this site. My signature certifies that I understand the procedures, equipment, and restrictions applicable to this project site and agree to abide by them.

Signature		Company	Date

ATTACHMENT 6
SAFETY DATA SHEETS

SAFETY DATA SHEET

Version 6.0
Revision Date 05/25/2018
Print Date 06/29/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Biphenyl

Product Number : W312908
Brand : Aldrich
Index-No. : 601-042-00-8

CAS-No. : 92-52-4

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)	
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Molecular weight	:	154.21 g/mol
CAS-No.	:	92-52-4
EC-No.	:	202-163-5
Index-No.	:	601-042-00-8

Hazardous components

Component	Classification	Concentration
Biphenyl	Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; Aquatic Acute 1; Aquatic Chronic 1; H315, H319, H335, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

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

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

- 4.2 Most important symptoms and effects, both acute and delayed**
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11
- 4.3 Indication of any immediate medical attention and special treatment needed**
No data available

5. FIREFIGHTING MEASURES

- 5.1 Extinguishing media**
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
- 5.2 Special hazards arising from the substance or mixture**
Carbon oxides
- 5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.
- 5.4 Further information**
No data available

6. ACCIDENTAL RELEASE MEASURES

- 6.1 Personal precautions, protective equipment and emergency procedures**
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.
- 6.2 Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
- 6.3 Methods and materials for containment and cleaning up**
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.
- 6.4 Reference to other sections**
For disposal see section 13.

7. HANDLING AND STORAGE

- 7.1 Precautions for safe handling**
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.
- 7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): 13: Non Combustible Solids
- 7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

- 8.1 Control parameters**
Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Biphenyl	92-52-4	TWA	0.200000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Pulmonary function		

		TWA	0.2 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Pulmonary function		
		TWA	0.2 ppm 1 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	0.200000 ppm 1.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	0.2 ppm 1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	0.200000 ppm 1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 480 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 30 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: crystalline
Colour: light yellow |
| b) Odour | characteristic |
| c) Odour Threshold | No data available |
| d) pH | 5.5 |
| e) Melting point/freezing point | Melting point/range: 68 - 70 °C (154 - 158 °F) - lit. |
| f) Initial boiling point and boiling range | 255 °C (491 °F) - lit. |
| g) Flash point | 110 °C (230 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | The product is not flammable. - Flammability (solids) |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 5.8 %(V)
Lower explosion limit: 0.6 %(V) |
| k) Vapour pressure | 0.04 hPa at 20 °C (68 °F)
5.5 hPa at 100 °C(212 °F)
12.6 hPa at 115 °C(239 °F)
95.7 hPa at 166 °C(331 °F) |
| l) Vapour density | No data available |
| m) Relative density | 0.992 g/cm ³ |
| n) Water solubility | 0.0075 g/l at 15 °C (59 °F) |
| o) Partition coefficient: n-octanol/water | log Pow: 4.008 at 25 °C (77 °F) |
| p) Auto-ignition temperature | 566 °C (1051 °F) at 1013.0 hPa |
| 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Dermal - Rabbit - > 5,010 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Irritating to skin. - 24 h

(Draize Test)

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

Maximisation Test - Guinea pig

Does not cause skin sensitisation.

(OECD Test Guideline 406)

Germ cell mutagenicity

Ames test

S. typhimurium

Result: negative

Mouse - male and female

Result: negative

Carcinogenicity

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: DU8050000

Liver injury may occur., Gastrointestinal disturbance

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish flow-through test LC50 - Pimephales promelas (fathead minnow) - 3 mg/l - 96 h(Biphenyl)
(OECD Test Guideline 203)

Toxicity to daphnia and other aquatic invertebrates flow-through test EC50 - Daphnia magna (Water flea) - 0.36 mg/l - 48 h(Biphenyl)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 14 d(Biphenyl)
Result: 84 % - Readily biodegradable.
(OECD Test Guideline 301C)

12.3 Bioaccumulative potential

Bioaccumulation Leuciscus idus (Golden orfe) - 3 d
- 50 µg/l(Biphenyl)

Bioconcentration factor (BCF): 281

12.4 Mobility in soil

No data available(Biphenyl)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Biphenyl)
Reportable Quantity (RQ) : 100 lbs

Marine pollutant: no no
Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Biphenyl)
Marine pollutant : yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Biphenyl)

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Biphenyl	92-52-4	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Biphenyl	92-52-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Biphenyl	92-52-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Biphenyl	92-52-4	2007-07-01

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

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

NFPA Rating

Health hazard:	2
Fire Hazard:	1
Reactivity Hazard:	0

Further information

Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 05/25/2018

Print Date: 06/29/2019

SAFETY DATA SHEET

Version 4.13

Revision Date 02/02/2018

Print Date 07/18/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Bis-(2-chloroisopropyl) ether

Product Number : 48498

Brand : Supelco

CAS-No. : 108-60-1

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

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 4), H227

Acute toxicity, Oral (Category 3), H301

Acute toxicity, Inhalation (Category 4), H332

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H227

Combustible liquid.

H301

Toxic if swallowed.

H332

Harmful if inhaled.

Precautionary statement(s)

P210

Keep away from heat/sparks/open flames/hot surfaces. No smoking.

P261

Avoid breathing dust/ fume/ gas/ mist/ vapours/ 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/ eye protection/ face protection.

P301 + P310 + P330

IF SWALLOWED: Immediately call a POISON CENTER/doctor. 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.

P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

P403 + P235 Store in a well-ventilated place. Keep cool.

P405 Store locked up.

P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : 2-Chloroisopropyl ether
Bis(2-Chloro-1-methylethyl) ether

Formula : C₆H₁₂Cl₂O
Molecular weight : 171.06 g/mol
CAS-No. : 108-60-1
EC-No. : 203-598-3

Hazardous components

Component	Classification	Concentration
Bis(2-chloro-1-methylethyl) ether		
	Flam. Liq. 4; Acute Tox. 3; Acute Tox. 4; H227, H301, H332	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

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

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

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Recommended storage temperature 2 - 8 °C

Storage class (TRGS 510): 6.1B: Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

Hazardous components without workplace control parameters

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

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

Skin protection

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

Body Protection

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

Respiratory protection

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

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance	Form: liquid Colour: colourless
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: -101.8 - -96.8 °C (-151.2 - -142.2 °F)
f) Initial boiling point and boiling range	187 °C (369 °F)
g) Flash point	85 °C (185 °F)
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	5.9 g/cm ³
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 220 - 270 mg/kg

LC50 Inhalation - Rat - 8 h - 350 mg/l

Skin corrosion/irritation

Serious eye damage/eye irritation

Respiratory or skin sensitisation

Germ cell mutagenicity

Carcinogenicity

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

Specific target organ toxicity - single exposure

Specific target organ toxicity - repeated exposure

Aspiration hazard

Additional Information

RTECS: Not available

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

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

12.2 Persistence and degradability

12.3 Bioaccumulative potential

12.4 Mobility in soil

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

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2490 Class: 6.1 Packing group: II
Proper shipping name: Dichloroisopropyl ether
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 2490 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: DICHLOROISOPROPYL ETHER

IATA

UN number: 2490 Class: 6.1 Packing group: II
Proper shipping name: Dichloroisopropyl ether

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Bis(2-chloro-1-methylethyl) ether	108-60-1	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Bis(2-chloro-1-methylethyl) ether	108-60-1	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Bis(2-chloro-1-methylethyl) ether	108-60-1	2007-07-01

	CAS-No.	Revision Date
Bis(2-chloro-1-methylethyl) ether	108-60-1	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Bis(2-chloro-1-methylethyl) ether	108-60-1	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Bis(2-chloro-1-methylethyl) ether	108-60-1	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Flam. Liq.	Flammable liquids
H227	Combustible liquid.
H301	Toxic if swallowed.
H332	Harmful if inhaled.

HMIS Rating

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

NFPA Rating

Health hazard:	1
Fire Hazard:	2
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.13

Revision Date: 02/02/2018

Print Date: 07/18/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 05/25/2018
Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : 2,4-Dichlorophenol

Product Number : 105953
Brand : Aldrich
Index-No. : 604-011-00-7

CAS-No. : 120-83-2

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

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 2), H300

Acute toxicity, Dermal (Category 3), H311

Skin corrosion (Category 1B), H314

Serious eye damage (Category 1), H318

Acute aquatic toxicity (Category 2), H401

Chronic aquatic toxicity (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word	Danger
Hazard statement(s)	
H300	Fatal if swallowed.
H311	Toxic in contact with skin.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H411	Toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P260	Do not breathe dust or mist.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Molecular weight	:	163.00 g/mol
CAS-No.	:	120-83-2
EC-No.	:	204-429-6
Index-No.	:	604-011-00-7

Hazardous components

Component	Classification	Concentration
2,4-Dichlorophenol	Acute Tox. 2; Acute Tox. 3; Skin Corr. 1B; Eye Dam. 1; Carc. 2; Aquatic Acute 2; Aquatic Chronic 2; H300, H311, H314, H351, H411	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

If swallowed

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

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Storage class (TRGS 510): 6.1B: Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
2,4-Dichlorophenol	120-83-2	TWA	1 ppm	USA. Workplace Environmental Exposure Levels (WEEL)
	Remarks	Skin Absorbed rapidly through the skin in molten or heated liquid form in amounts that have caused rapid death in humans		

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- a) Appearance Form: crystalline
 Colour: light brown
- b) Odour No data available

c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 42 - 43 °C (108 - 109 °F) - lit.
f) Initial boiling point and boiling range	209 - 210 °C (408 - 410 °F) - lit.
g) Flash point	114.0 °C (237.2 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	0.1 hPa at 25.0 °C (77.0 °F)
l) Vapour density	No data available
m) Relative density	1.38 g/cm ³ at 60.00 °C (140.00 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 3.06 log Pow: 5
p) Auto-ignition 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

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

Oxidizing agents, acids, Acid chlorides, Acid anhydrides, Metals

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

absorption

Inhalation: Corrosive to respiratory system.

LD50 Dermal - Rat - 780 mg/kg

(OECD Test Guideline 402)

Dermal: absorption

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Causes burns.

Remarks: (IUCLID)

Serious eye damage/eye irritation

Causes serious eye damage.

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Mutagenicity (mammal cell test): chromosome aberration.

Result: negative

(National Toxicology Program)

Mutagenicity (mammal cell test):

Result: positive

(National Toxicology Program)

Carcinogenicity

IARC: 2B - Group 2B: Possibly carcinogenic to humans (2,4-Dichlorophenol)

IARC: 2B - Group 2B: Possibly carcinogenic to humans (2,4-Dichlorophenol)

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

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Acute oral toxicity - If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the oesophagus and the stomach.

Acute inhalation toxicity - mucosal irritations, Cough, Shortness of breath, Possible damages:, damage of respiratory tract

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: SK8575000

spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Weakness, Lowered blood pressure, Tremors, Dizziness, Confusion., Convulsions, Cyanosis, Shock., Unconsciousness, Symptoms may be delayed., Molten or hot 2,4-Dichlorophenol is immediately absorbed through the skin in amounts which have caused death in humans. Rapid death in humans has been caused by skin exposure without immediate decontamination. Amounts of molten 2,4-Dichlorophenol that may cover as little as 1% body surface area (hand-size) may cause death.

Systemic effects:

After absorption:

Discomfort, Nausea, Vomiting, Headache, Thirst, Drowsiness, Shortness of breath, collapse, Convulsions, Coma, respiratory arrest

Damage to:

Liver, Kidney, Central nervous system

Further data:

Handle in accordance with good industrial hygiene and safety practice.

Blood -

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish LC50 - Carassius auratus (goldfish) - 1.24 mg/l - 96 h(2,4-Dichlorophenol)
Remarks: (ECOTOX Database)

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 1.4 mg/l - 48 h(2,4-Dichlorophenol)
Remarks: (IUCLID)

Toxicity to algae IC50 - Dunaliella bioculata - 16 - 19 mg/l - 72 h(2,4-Dichlorophenol)
Remarks: (ECOTOX Database)

12.2 Persistence and degradability

Biodegradability Result: 0 % - Not readily biodegradable.
(OECD Test Guideline 301C)

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(2,4-Dichlorophenol)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life with long lasting effects.

Discharge into the environment must be avoided.

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2020 Class: 6.1 Packing group: III
Proper shipping name: Chlorophenols, solid
Reportable Quantity (RQ) : 100 lbs

Marine pollutant: no no
Poison Inhalation Hazard: No

IMDG

UN number: 2020 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: CHLOROPHENOLS, SOLID
Marine pollutant : yes

IATA

UN number: 2020 Class: 6.1 Packing group: III
Proper shipping name: Chlorophenols, solid

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
2,4-Dichlorophenol	120-83-2	2011-07-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
2,4-Dichlorophenol	120-83-2	2011-07-01

	CAS-No.	Revision Date
2,4-Dichlorophenol	120-83-2	2011-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2,4-Dichlorophenol	120-83-2	2011-07-01

	CAS-No.	Revision Date
2,4-Dichlorophenol	120-83-2	2011-07-01

	CAS-No.	Revision Date
2,4-Dichlorophenol	120-83-2	2011-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
2,4-Dichlorophenol	120-83-2	2011-07-01

	CAS-No.	Revision Date
2,4-Dichlorophenol	120-83-2	2011-07-01

California Prop. 65 Components

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

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H300	Fatal if swallowed.
H311	Toxic in contact with skin.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H351	Suspected of causing cancer.
H401	Toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	4
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	3
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 05/25/2018

Print Date: 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : 2,4-Dimethylphenol

Product Number : D174203

Brand : Aldrich

Index-No. : 604-006-00-X

CAS-No. : 105-67-9

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

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301

Acute toxicity, Dermal (Category 3), H311

Skin corrosion (Category 1B), H314

Serious eye damage (Category 1), H318

Acute aquatic toxicity (Category 2), H401

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301 + H311

Toxic if swallowed or in contact with skin.

H314

Causes severe skin burns and eye damage.

H401

Toxic to aquatic life.

Precautionary statement(s)

P264

Wash skin thoroughly after handling.

P270

Do not eat, drink or smoke when using this product.

P273

Avoid release to the environment.

P280

Wear protective gloves/ protective clothing/ eye protection/ face protection.

P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position 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/doctor.
P322	Specific measures (see supplemental first aid instructions on this label).
P361	Remove/Take off immediately all contaminated clothing.
P363	Wash contaminated clothing before reuse.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	4-Hydroxy-m-xylene asym.-m-Xylenol
Formula	:	C ₈ H ₁₀ O
Molecular weight	:	122.16 g/mol
CAS-No.	:	105-67-9
EC-No.	:	203-321-6
Index-No.	:	604-006-00-X

Hazardous components

Component	Classification	Concentration
2,4-Xylenol	Acute Tox. 3; Skin Corr. 1B; Eye Dam. 1; Aquatic Acute 2; H301 + H311, H314, H401	-

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

If swallowed

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

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

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

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Storage class (TRGS 510): 6.1B: Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

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

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 60 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: Semi-solid melting to a liquid, clear
Colour: brown |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 22 - 23 °C (72 - 73 °F) - lit. |
| f) Initial boiling point and boiling range | 211 - 212 °C (412 - 414 °F) - lit. |
| g) Flash point | 94.0 °C (201.2 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 0.1 hPa (0.1 mmHg) at 25.0 °C (77.0 °F) |
| l) Vapour density | No data available |
| m) Relative density | 1.011 g/cm ³ at 25 °C (77 °F) |

- | | |
|---|-------------------|
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | log Pow: 2.35 |
| p) Auto-ignition 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

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

Bases, Acid chlorides, Acid anhydrides, Oxidizing agents, Brass, Copper

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 3,200 mg/kg

Inhalation: No data available

LD50 Dermal - Rat - 1,040 mg/kg

No data available

Skin corrosion/irritation

Causes burns.

Serious eye damage/eye irritation

Risk of serious damage to eyes.

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

No component of this product present at levels greater than or equal to 0.1% is identified as

probable, possible or confirmed human carcinogen by IARC.

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

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: ZE5600000

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - *Oncorhynchus mykiss* (rainbow trout) - 9.2 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates LC50 - *Daphnia magna* (Water flea) - 2.1 mg/l - 48 h

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation *Lepomis macrochirus* (Bluegill) - 28 d
- 0.0102 mg/l

Bioconcentration factor (BCF): 150

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2261 Class: 6.1 Packing group: II
Proper shipping name: Xylenols, solid
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 2261 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: XYLENOLS, SOLID

IATA

UN number: 2261 Class: 6.1 Packing group: II
Proper shipping name: Xylenols, solid

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
2,4-Xylenol	105-67-9	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
2,4-Xylenol	105-67-9	2007-07-01

	CAS-No.	Revision Date
2,4-Xylenol	105-67-9	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2,4-Xylenol	105-67-9	2007-07-01

	CAS-No.	Revision Date
2,4-Xylenol	105-67-9	2007-07-01

	CAS-No.	Revision Date
2,4-Xylenol	105-67-9	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
2,4-Xylenol	105-67-9	2007-07-01

California Prop. 65 Components

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

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

16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Eye Dam.	Serious eye damage
H301	Toxic if swallowed.
H301 + H311	Toxic if swallowed or in contact with skin.
H311	Toxic in contact with skin.
H314	Causes severe skin burns and eye damage.

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	
Flammability:	1
Physical Hazard	0

NFPA Rating

Health hazard:	3
Fire Hazard:	1
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.7

Revision Date: 01/10/2018

Print Date: 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : 2,4-Dinitrophenol

Product Number : D198501

Brand : Aldrich

CAS-No. : 51-28-5

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

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301

Acute toxicity, Inhalation (Category 3), H331

Acute toxicity, Dermal (Category 3), H311

Specific target organ toxicity - repeated exposure (Category 2), H373

Acute aquatic toxicity (Category 1), H400

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301 + H311 + H331

H373

H400

Toxic if swallowed, in contact with skin or if inhaled.

May cause damage to organs through prolonged or repeated exposure.

Very toxic to aquatic life.

Precautionary statement(s)

P260

P264

P270

P271

P273

P280

Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.

Wash skin thoroughly after handling.

Do not eat, drink or smoke when using this product.

Use only outdoors or in a well-ventilated area.

Avoid release to the environment.

Wear protective gloves/ protective clothing.

P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of water. Call a POISON CENTER/doctor if you feel unwell.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor.
P314	Get medical advice/ attention if you feel unwell.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
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 Hazards not otherwise classified (HNOC) or not covered by GHS

Desensitised explosive

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Synonyms : α -Dinitrophenol

Formula : $C_6H_4N_2O_5$

Molecular weight : 184.11 g/mol

Hazardous components

Component	Classification	Concentration
2,4-Dinitrophenol		
CAS-No. 51-28-5	Acute Tox. 3; STOT RE 2; Aquatic Acute 1; H301 + H311 + H331, H373, H400	70 - 90 %
EC-No. 200-087-7		
Index-No. 609-041-00-4		

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Light sensitive. Heat sensitive.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

Hazardous components without workplace control parameters

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: crystalline
Colour: yellow |
| b) Odour | sweet |
| c) Odour Threshold | No data available |
| d) pH | 2.6 - 4.4 |
| e) Melting point/freezing point | Melting point/range: 108 - 112 °C (226 - 234 °F) - lit. |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 1.99 hPa (1.49 mmHg) at 18 °C (64 °F) |
| l) Vapour density | No data available |
| m) Relative density | 1.683 g/cm ³ at 24 °C (75 °F) |

- | | |
|---|------------------------------------|
| n) Water solubility | 5.6 g/l at 18 °C (64 °F) - soluble |
| o) Partition coefficient: n-octanol/water | log Pow: 1.54 |
| p) Auto-ignition 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

Dissociation constant 4.09

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

Heat Explosive when dry.

10.5 Incompatible materials

Strong oxidizing agents, Strong bases, Acid chlorides, Acid anhydrides

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Nitrogen oxides (NOx)

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

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

Reproductive toxicity

No data available
No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

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

Lungs - (2,4-Dinitrophenol)

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Contact a licensed professional waste disposal service to dispose of this material. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1320 Class: 4.1 (6.1) Packing group: I
Proper shipping name: Dinitrophenol, wetted
Reportable Quantity (RQ): 12 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1320 Class: 4.1 (6.1) Packing group: I EMS-No: F-B, S-J
Proper shipping name: DINITROPHENOL, WETTED

Marine pollutant:yes

Marine pollutant: yes

IATA

UN number: 1320 Class: 4.1 (6.1) Packing group: I
Proper shipping name: Dinitrophenol, wetted

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
2,4-Dinitrophenol	51-28-5	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
2,4-Dinitrophenol	51-28-5	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2,4-Dinitrophenol	51-28-5	2007-07-01
Water	7732-18-5	

	CAS-No.	Revision Date
2,4-Dinitrophenol	51-28-5	2007-07-01
Water	7732-18-5	

New Jersey Right To Know Components

	CAS-No.	Revision Date
2,4-Dinitrophenol	51-28-5	2007-07-01
Water	7732-18-5	

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
H301	Toxic if swallowed.
H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled.
H311	Toxic in contact with skin.
H331	Toxic if inhaled.
H373	May cause damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
STOT RE	Specific target organ toxicity - repeated exposure

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	4

NFPA Rating

Health hazard:	3
Fire Hazard:	0

Reactivity Hazard: 4

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.11

Revision Date: 05/24/2017

Print Date: 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : 2-Butanone

Product Number : 443468
Brand : Sigma-Aldrich
Index-No. : 606-002-00-3

CAS-No. : 78-93-3

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 sheetCompany : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USATelephone : +1 800-325-5832
Fax : +1 800-325-5052**1.4 Emergency telephone number**

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 2), H225

Eye irritation (Category 2A), H319

Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H225

Highly flammable liquid and vapour.

H319

Causes serious eye irritation.

H336

May cause drowsiness or dizziness.

Precautionary statement(s)

P210

Keep away from heat/sparks/open flames/hot surfaces. No smoking.

P233

Keep container tightly closed.

P240

Ground/bond container and receiving equipment.

P241

Use explosion-proof electrical/ ventilating/ lighting/ equipment.

P242

Use only non-sparking tools.

P243

Take precautionary measures against static discharge.

P261

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

P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: Methyl ethyl ketone MEK Ethyl methyl ketone
Formula	: C ₄ H ₈ O
Molecular weight	: 72.11 g/mol
CAS-No.	: 78-93-3
EC-No.	: 201-159-0
Index-No.	: 606-002-00-3
Registration number	: 01-2119457290-43-XXXX

Hazardous components

Component	Classification	Concentration
Ethyl methyl ketone	Flam. Liq. 2; Eye Irrit. 2A; STOT SE 3; H225, H319, H336	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

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

If swallowed

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

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Dry powder Dry sand

Unsuitable extinguishing media

Do NOT use water jet.

5.2 Special hazards arising from the substance or mixture

Flash back possible over considerable distance., Container explosion may occur under fire conditions.

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

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

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

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

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

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Hygroscopic.

Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Ethyl methyl ketone	78-93-3	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Upper Respiratory Tract irritation Peripheral Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section)		
		STEL	300 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Peripheral Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section)		
		TWA	200 ppm 590 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	300 ppm 885 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	200 ppm 590 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		PEL	200 ppm 590 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	300 ppm 885 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
	-	methyl ethyl ketone	2 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Splash contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 292 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: liquid, clear
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | -87 °C (-125 °F) |
| f) Initial boiling point and boiling range | 80 °C (176 °F) - lit. |
| g) Flash point | -3 °C (27 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 10.1 %(V)
Lower explosion limit: 1.8 %(V) |
| k) Vapour pressure | 95 hPa (71 mmHg) at 20 °C (68 °F) |
| l) Vapour density | 2.49 - (Air = 1.0) |
| m) Relative density | 0.805 g/mL at 25 °C (77 °F) |
| n) Water solubility | soluble |
| o) Partition coefficient: n-octanol/water | log Pow: 0.29 |
| p) Auto-ignition 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

- | | |
|-------------------------|----------------------------|
| Surface tension | 24.6 mN/m at 20 °C (68 °F) |
| Relative vapour density | 2.49 - (Air = 1.0) |

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

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Exposure to moisture
Heat, flames and sparks.

10.5 Incompatible materials

Oxidizing agents, Strong reducing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 2,737 mg/kg

LC50 Inhalation - Mouse - 4 h - 32,000 mg/m³

LC50 Inhalation - Mammal - 38,000 mg/m³

LD50 Dermal - Rabbit - 6,480 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation
(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Irritating to eyes.
(OECD Test Guideline 405)

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: EL6475000

Central nervous system depression, Gastrointestinal disturbance, narcosis

Liver - Irregularities - Based on Human Evidence

Liver - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish mortality NOEC - *Cyprinodon variegatus* (sheepshead minnow) - 400 mg/l - 96 h

LC50 - *Pimephales promelas* (fathead minnow) - 3,130 - 3,320 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates LC50 - *Daphnia magna* (Water flea) - > 520 mg/l - 48 h

EC50 - *Daphnia magna* (Water flea) - 7,060 mg/l - 24 h

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

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

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

Contaminated packaging

Dispose of as unused product.

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

UN number: 1193 Class: 3 Packing group: II

Proper shipping name: Ethyl methyl ketone

Reportable Quantity (RQ): 5000 lbs Reportable Quantity (RQ): 5000 lbs Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1193 Class: 3 Packing group: II EMS-No: F-E, S-D

Proper shipping name: ETHYL METHYL KETONE

IATA

SAFETY DATA SHEET

Version 6.0
Revision Date 04/15/2019
Print Date 07/17/2019

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : 2-Chloronaphthalene
Product Number : 48517
Brand : Supelco
CAS-No. : 91-58-7

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 Street
ST. LOUIS MO 63103
UNITED STATES
Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Short-term (acute) aquatic hazard (Category 2), H401
Long-term (chronic) aquatic hazard (Category 2), H411

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 none

Hazard statement(s)
H411

Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P273 Avoid release to the environment.
P391 Collect spillage.
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 : C₁₀H₇Cl
Molecular weight : 162.62 g/mol
CAS-No. : 91-58-7
EC-No. : 202-079-9

Component	Classification	Concentration
2-Chloronaphthalene		
	Aquatic Acute 2; Aquatic Chronic 2; H401, H411	<= 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

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Store at room temperature.

Storage class (TRGS 510): 13: Non Combustible Solids

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

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Body Protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|---|----------------------|
| a) Appearance | Form: solid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | No data available |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | ()No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |

- | | |
|--|-------------------|
| l) Vapour density | No data available |
| m) Relative density | No data available |
| n) Water solubility | No data available |
| o) Partition coefficient:
n-octanol/water | No data available |
| p) Auto-ignition
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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 2,078 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

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

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates Immobilization EC50 - Daphnia magna (Water flea) - 1.64 mg/l - 48 h

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

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

Toxic to aquatic life.

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

SECTION 15: Regulatory information

SARA 302 Components

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

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.

Massachusetts Right To Know Components

	CAS-No.	Revision Date
2-Chloronaphthalene	91-58-7	1993-02-16

2-Chloronaphthalene	CAS-No. 91-58-7	Revision Date 1993-02-16
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Pennsylvania Right To Know Components

2-Chloronaphthalene	CAS-No. 91-58-7	Revision Date 1993-02-16
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2-Chloronaphthalene	CAS-No. 91-58-7	Revision Date 1993-02-16
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2-Chloronaphthalene	CAS-No. 91-58-7	Revision Date 1993-02-16
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New Jersey Right To Know Components

2-Chloronaphthalene	CAS-No. 91-58-7	Revision Date 1993-02-16
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2-Chloronaphthalene	CAS-No. 91-58-7	Revision Date 1993-02-16
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California Prop. 65 Components

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

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

SECTION 16: Other information

Further information

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

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Version: 6.0

Revision Date: 04/15/2019

Print Date: 07/17/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 2-Chlorophenol

Product Number : 185779
Brand : Aldrich
Index-No. : 604-008-00-0

CAS-No. : 95-57-8

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 4), H227
Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 4), H332
Acute toxicity, Dermal (Category 4), H312
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

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

Warning

Hazard statement(s)

H227 Combustible liquid.
H302 + H312 + H332 Harmful if swallowed, in contact with skin or if inhaled.
H411 Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.

P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P304 + P340 + P312	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.
P363	Wash contaminated clothing before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P391	Collect spillage.
P403 + P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Stench.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₆ H ₅ ClO
Molecular weight	: 128.56 g/mol
CAS-No.	: 95-57-8
EC-No.	: 202-433-2
Index-No.	: 604-008-00-0

Hazardous components

Component	Classification	Concentration
2-Chlorophenol	Flam. Liq. 4; Acute Tox. 4; Aquatic Acute 2; Aquatic Chronic 2; H227, H302 + H312 + H332, H411	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

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

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

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

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

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Stench.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 480 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 30 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|--|---|
| a) Appearance | Form: liquid, clear
Colour: light yellow |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 8 °C (46 °F) - lit. |
| f) Initial boiling point and boiling range | 175 - 176 °C (347 - 349 °F) - lit. |
| g) Flash point | 64.0 °C (147.2 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or | No data available |

explosive limits

- | | |
|---|---|
| k) Vapour pressure | 1.3 hPa (1.0 mmHg) at 121.0 °C (249.8 °F) |
| l) Vapour density | No data available |
| m) Relative density | 1.241 g/cm ³ at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | log Pow: 2.32log Pow: 2.17log Pow: 5 |
| p) Auto-ignition 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

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Acid chlorides, Acid anhydrides, Oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 670.0 mg/kg

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as

probable, possible or confirmed human carcinogen by IARC.

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

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

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: SK2625000

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Kidney -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Lepomis macrochirus (Bluegill) - 5.7 - 12 mg/l - 96.0 h
	LC50 - Pimephales promelas (fathead minnow) - 6 - 16 mg/l - 96.0 h
	LC50 - Carassius auratus (goldfish) - 10.7 - 15.2 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 6.30 - 17.90 mg/l - 24 h
	Immobilization EC50 - Daphnia magna (Water flea) - 3.91 mg/l - 48 h
Toxicity to algae	EC50 - Pseudokirchneriella subcapitata (green algae) - 70.00 mg/l - 96 h
	EC50 - Chlorella vulgaris (Fresh water algae) - 170.00 mg/l - 96 h

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Bioaccumulation Lepomis macrochirus (Bluegill) - 28 d
- 0.00918 mg/l

Bioconcentration factor (BCF): 214

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

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

Toxic to aquatic life with long lasting effects.

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

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

UN number: 2021 Class: 6.1 Packing group: III

Proper shipping name: Chlorophenols, liquid

Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 2021 Class: 6.1 Packing group: III EMS-No: F-A, S-A

Proper shipping name: CHLOROPHENOLS, LIQUID

IATA

UN number: 2021 Class: 6.1 Packing group: III

Proper shipping name: Chlorophenols, liquid

15. REGULATORY INFORMATION**SARA 302 Components**

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

SARA 313 Components

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

	CAS-No.	Revision Date
2-Chlorophenol	95-57-8	1993-02-16

Massachusetts Right To Know Components

	CAS-No.	Revision Date
2-Chlorophenol	95-57-8	1993-02-16

	CAS-No.	Revision Date
2-Chlorophenol	95-57-8	1993-02-16

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2-Chlorophenol	95-57-8	1993-02-16

	CAS-No.	Revision Date
2-Chlorophenol	95-57-8	1993-02-16

	CAS-No.	Revision Date

2-Chlorophenol

95-57-8

1993-02-16

New Jersey Right To Know Components

2-Chlorophenol

CAS-No.
95-57-8

Revision Date
1993-02-16

2-Chlorophenol

CAS-No.
95-57-8

Revision Date
1993-02-16

California Prop. 65 Components

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

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Flam. Liq.	Flammable liquids
H227	Combustible liquid.
H302	Harmful if swallowed.
H302 + H312 + H332	Harmful if swallowed, in contact with skin or if inhaled.

HMIS Rating

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

NFPA Rating

Health hazard:	1
Fire Hazard:	2
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.6

Revision Date: 05/17/2018

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 5.4
Revision Date 01/26/2016
Print Date 07/17/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : 2-Methylnaphthalene

Product Number : 45796
Brand : Sigma-Aldrich

CAS-No. : 91-57-6

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

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

Warning

Hazard statement(s)

H302

Harmful if swallowed.

H411

Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P264

Wash skin thoroughly after handling.

P270

Do not eat, drink or smoke when using this product.

P273

Avoid release to the environment.

P301 + P312 + P330

IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell. Rinse mouth.

P391

Collect spillage.

P501

Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : β -Methylnaphthalene

Formula : C₁₁H₁₀

Molecular weight : 142.20 g/mol

CAS-No. : 91-57-6

EC-No. : 202-078-3

Hazardous components

Component	Classification	Concentration
2-Methylnaphthalene		
	Acute Tox. 4; Aquatic Acute 2; Aquatic Chronic 2; H302, H411	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): Non Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
2-Methylnaphthalene	91-57-6	TWA	0.500000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Skin contact does contribute to exposure. Not classifiable as a human carcinogen		
		TWA	0.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Lower Respiratory Tract irritation Lung damage Not classifiable as a human carcinogen Danger of cutaneous absorption		

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|-------------------------------------|
| a) Appearance | Form: solid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | 34.0 - 36.0 °C (93.2 - 96.8 °F) |
| f) Initial boiling point and boiling range | 241.0 - 242.0 °C (465.8 - 467.6 °F) |
| g) Flash point | 98.0 °C (208.4 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | 1.00 g/cm ³ |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | log Pow: 3.80 |
| p) Auto-ignition 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

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

Oxidizing agents

10.6 Hazardous decomposition products

Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 1,630 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Mild skin irritation

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

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

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure**Specific target organ toxicity - repeated exposure**

No data available

Aspiration hazard

No data available

Additional Information

RTECS: QJ9635000

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

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish LC50 - Pimephales promelas (fathead minnow) - 2.5 mg/l

Toxicity to daphnia and other aquatic invertebrates Immobilization EC50 - Daphnia magna (Water flea) - 1.5 mg/l - 48 h

12.2 Persistence and degradability**12.3 Bioaccumulative potential**

Bioaccumulation Oncorhynchus mykiss (rainbow trout) - 28 d
- 0.017 mg/l

Bioconcentration factor (BCF): 23,500

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

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

Not dangerous goods

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (2-Methylnaphthalene)
Marine pollutant:yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (2-Methylnaphthalene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Acute Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2-Methylnaphthalene	91-57-6	2010-08-02

New Jersey Right To Know Components

	CAS-No.	Revision Date
2-Methylnaphthalene	91-57-6	2010-08-02

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H302	Harmful if swallowed.
H401	Toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.

HMIS Rating

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

NFPA Rating

Health hazard:	2
Fire Hazard:	1
Reactivity Hazard:	0

Further information

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

Version: 5.4

Revision Date: 01/26/2016

Print Date: 07/17/2019

SAFETY DATA SHEET

Version 4.12

Revision Date 08/10/2016

Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : 2-Methylphenol

Product Number : 442361
Brand : Supelco
Index-No. : 604-004-00-9

CAS-No. : 95-48-7

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

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301
Acute toxicity, Dermal (Category 3), H311
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H301 + H311 : Toxic if swallowed or in contact with skin
H314 : Causes severe skin burns and eye damage.
H318 : Causes serious eye damage.
H411 : Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P260 : Do not breathe dust or mist.
P264 : Wash skin thoroughly after handling.

P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
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 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : o-Cresol
2-Methylphenol

Formula : C7H8O
Molecular weight : 108.14 g/mol
CAS-No. : 95-48-7
EC-No. : 202-423-8
Index-No. : 604-004-00-9

Hazardous components

Component	Classification	Concentration
o-Cresol	Acute Tox. 3; Skin Corr. 1B; Eye Dam. 1; Aquatic Acute 2; Aquatic Chronic 2; H301 + H311, H314, H318, H411	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

If swallowed

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

- 4.2 Most important symptoms and effects, both acute and delayed**
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11
- 4.3 Indication of any immediate medical attention and special treatment needed**
No data available
-

5. FIREFIGHTING MEASURES

- 5.1 Extinguishing media**
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
- 5.2 Special hazards arising from the substance or mixture**
No data available
- 5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.
- 5.4 Further information**
No data available
-

6. ACCIDENTAL RELEASE MEASURES

- 6.1 Personal precautions, protective equipment and emergency procedures**
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.
- 6.2 Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
- 6.3 Methods and materials for containment and cleaning up**
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.
- 6.4 Reference to other sections**
For disposal see section 13.
-

7. HANDLING AND STORAGE

- 7.1 Precautions for safe handling**
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.
- 7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place.

Air and light sensitive. Keep in a dry place.
- 7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated
-

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

- 8.1 Control parameters**
Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
o-Cresol	95-48-7	TWA	5.000000 ppm 22.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Skin contact does contribute to exposure.		
		TWA	5.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Eye, skin, & Upper Respiratory Tract irritation Adopted values or notations enclosed are those for which changes are proposed in the NIC 2010 Revision or addition to the notice of intended changes See Notice of Intended Changes (NIC) Danger of cutaneous absorption		
		TWA	2.300000 ppm 10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	20.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	5 ppm 22 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation The value in mg/m3 is approximate.		
		TWA	20 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Not classifiable as a human carcinogen Danger of cutaneous absorption		
		PEL	5 ppm 22 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 480 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.2 mm

Break through time: 30 min

Material tested: Dermatri® P (KCL 743 / Aldrich Z677388, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: powder
Colour: white |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | 4.5 at 25.00000 g/l |
| e) Melting point/freezing point | Melting point/range: 29 - 31 °C (84 - 88 °F) - lit. |
| f) Initial boiling point and boiling range | 191 °C (376 °F) - lit. |
| g) Flash point | 81.0 °C (177.8 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 58 %(V)
Lower explosion limit: 1.3 %(V) |
| k) Vapour pressure | 3.1 hPa (2.3 mmHg) at 60.0 °C (140.0 °F)
1.3 hPa (1.0 mmHg) at 38.2 °C (100.8 °F)
0.4 hPa (0.3 mmHg) at 20.0 °C (68.0 °F) |
| l) Vapour density | No data available |
| m) Relative density | 1.05 g/cm ³ at 20.00 °C (68.00 °F) |
| n) Water solubility | 25 g/l at 20 °C (68 °F) |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition temperature | 599.0 °C (1,110.2 °F) |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |

- s) Explosive properties No data available
- t) Oxidizing properties No data available

9.2 Other safety information

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

Oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 121.0 mg/kg

Remarks: Behavioral:Convulsions or effect on seizure threshold. Lungs, Thorax, or Respiration:Dyspnea.

Gastrointestinal:Ulceration or bleeding from stomach.

LC50 Inhalation - Rat - 1 h - > 1,220 mg/m³

Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Lacrimation. Behavioral:Somnolence (general depressed activity).

LD50 Dermal - Rabbit - 890.0 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Severe skin irritation - 24 h

(Draize Test)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Severe eye irritation

(Draize Test)

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

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

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: GO6300000

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Central nervous system depression, Diarrhoea, Gastrointestinal disturbance

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - Leuciscus idus (Golden orfe) - 10.00 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates Immobilization EC50 - Daphnia magna (Water flea) - 15.8 mg/l - 48 h

Toxicity to algae EC50 - SELENASTRUM - 100.00 mg/l - 72 h

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Toxic to aquatic life with long lasting effects.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3455 Class: 6.1 (8) Packing group: II
Proper shipping name: Cresols, solid
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 3455 Class: 6.1 (8) Packing group: II EMS-No: F-A, S-B
Proper shipping name: CRESOLS, SOLID

IATA

UN number: 3455 Class: 6.1 (8) Packing group: II
Proper shipping name: Cresols, solid

15. REGULATORY INFORMATION

SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
o-Cresol	95-48-7	2007-07-01

SARA 313 Components

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

	CAS-No.	Revision Date
o-Cresol	95-48-7	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
o-Cresol	95-48-7	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
o-Cresol	95-48-7	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
o-Cresol	95-48-7	2007-07-01

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Eye Dam.	Serious eye damage
H301	Toxic if swallowed.
H301 + H311	Toxic if swallowed or in contact with skin
H311	Toxic in contact with skin.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.

HMIS Rating

Health hazard: 3
Chronic Health Hazard: *
Flammability: 0
Physical Hazard 0

NFPA Rating

Health hazard: 3
Fire Hazard: 2
Reactivity Hazard: 0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.12

Revision Date: 08/10/2016

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 05/28/2019
Print Date 06/29/2019

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : 2-Nitrophenol

Product Number : N19702

Brand : Aldrich

CAS-No. : 88-75-5

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Short-term (acute) aquatic hazard (Category 3), H402

Long-term (chronic) aquatic hazard (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram : none

Signal word : none

Hazard statement(s)

H412 : Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P273 : Avoid release to the environment.

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 : $C_6H_5NO_3$
Molecular weight : 139.11 g/mol
CAS-No. : 88-75-5
EC-No. : 201-857-5

Component	Classification	Concentration
2-Nitrophenol		
	Aquatic Acute 3; Aquatic Chronic 3; H402, H412	<= 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

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Nitrogen oxides (NOx)

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Light sensitive.

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

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- a) Appearance Form: solid

b) Odour	phenol-like
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point: 44 °C (111 °F) at 1,013 hPa - OECD Test Guideline 102
f) Initial boiling point and boiling range	215 - 216 °C 419 - 421 °F at 1,013 hPa
g) Flash point	100.5 °C (212.9 °F) - closed cup - EN 2719
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	1 hPa at 49 °C (120 °F) 0.15 hPa at 25 °C(77 °F)
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	2.1 g/l at 20 °C (68 °F)
o) Partition coefficient: n-octanol/water	log Pow: 1.79 - Bioaccumulation is not expected., (Lit.)
p) Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Nitrogen oxides (NOx)

Other decomposition products - No data available

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 2,830 mg/kg

Remarks: (IUCLID)

Inhalation: No data available

LD50 Dermal - Rabbit - > 7,940 mg/kg

Remarks: (RTECS)

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation

(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: slight irritation

Remarks: (IUCLID)

Respiratory or skin sensitisation

Buehler Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

Germ cell mutagenicity

Ames test

Salmonella typhimurium

Result: negative

Carcinogenicity

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Acute oral toxicity - Nausea

Acute inhalation toxicity - mucosal irritations, Cough, Shortness of breath

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: SM2100000

Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed 2 to 4 hours or longer. Depending on the intensity and duration of exposure, effects may vary from mild irritation to severe destruction of tissue. prolonged or repeated exposure can cause: Damage to the eyes. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Danio rerio (zebra fish) - 72.5 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 17 mg/l - 48 h Remarks: (IUCLID)
Toxicity to bacteria	EC50 - Photobacterium phosphoreum - 21 mg/l - 5 min Remarks: (IUCLID)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 d
Result: 0 % - Not readily biodegradable.
(OECD Test Guideline 301C)

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

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

Harmful to aquatic life with long lasting effects.

Discharge into the environment must be avoided.

SECTION 13: Disposal considerations**13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information**DOT (US)**

UN number: 1663 Class: 6.1 Packing group: III
Proper shipping name: Nitrophenols
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1663 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: NITROPHENOLS (o-, m-, p-)

IATA

UN number: 1663 Class: 6.1 Packing group: III
Proper shipping name: Nitrophenols

SECTION 15: Regulatory information**SARA 302 Components**

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

SARA 313 Components

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

	CAS-No.	Revision Date
2-Nitrophenol	88-75-5	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2-Nitrophenol	88-75-5	2007-07-01

SECTION 16: Other information

Further information

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

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: 6.1

Revision Date: 05/28/2019

Print Date: 06/29/2019

SAFETY DATA SHEET

Version 5.5
Revision Date 06/13/2014
Print Date 10/19/2018

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : 4,4'-DDD

Product Number : 49009
Brand : Supelco

CAS-No. : 72-54-8

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

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

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301
Acute toxicity, Dermal (Category 4), H312
Carcinogenicity (Category 2), H351
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301 Toxic if swallowed.
H312 Harmful in contact with skin.
H351 Suspected of causing cancer.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.

P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P322	Specific measures (see supplemental first aid instructions on this label).
P330	Rinse mouth.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethane
Formula	: C ₁₄ H ₁₀ Cl ₄
Molecular Weight	: 320.04 g/mol
CAS-No.	: 72-54-8
EC-No.	: 200-783-0

Hazardous components

Component	Classification	Concentration
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane		
	Acute Tox. 3; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H312, H351, H410	-

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

no data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

- 5.2 Special hazards arising from the substance or mixture**
Carbon oxides, Hydrogen chloride gas
Nature of decomposition products not known.
- 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

- 6.1 Personal precautions, protective equipment and emergency procedures**
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.
- 6.2 Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
- 6.3 Methods and materials for containment and cleaning up**
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.
- 6.4 Reference to other sections**
For disposal see section 13.

7. HANDLING AND STORAGE

- 7.1 Precautions for safe handling**
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.
For precautions see section 2.2.
- 7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place.
- 7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

- 8.1 Control parameters**
Components with workplace control parameters
Contains no substances with occupational exposure limit values.
- 8.2 Exposure controls**
Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.
- Personal protective equipment**
- Eye/face protection**
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).
 - Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.
 - Body Protection**
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: solid |
| b) Odour | no data available |
| c) Odour Threshold | no data available |
| d) pH | no data available |
| e) Melting point/freezing point | 94.0 - 96.0 °C (201.2 - 204.8 °F) |
| f) Initial boiling point and boiling range | 193.0 °C (379.4 °F) at 1.3 hPa (1.0 mmHg) |
| g) Flash point | no data available |
| h) Evaporation rate | no data available |
| i) Flammability (solid, gas) | no data available |
| j) Upper/lower flammability or explosive limits | no data available |
| k) Vapour pressure | < 0.00001 hPa (< 0.00001 mmHg) at 25.0 °C (77.0 °F) |
| l) Vapour density | no data available |
| m) Relative density | 1.38 g/cm ³ |
| n) Water solubility | no data available |
| o) Partition coefficient: n-octanol/water | log Pow: 6.02 |
| p) Auto-ignition 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

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

Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Hamster - > 5,000 mg/kg

TDLo Oral - Human - 428.5 mg/kg

Remarks: Endocrine:Adrenal cortex hypoplasia.

TDLo Oral - rat - 6,000 mg/kg

Remarks: Cardiac:Other changes. Gastrointestinal:Other changes. Kidney, Ureter, Bladder:Changes in both tubules and glomeruli.

TDLo Oral - rat - 14 mg/kg

Remarks: Liver:Changes in liver weight. Endocrine:Estrogenic. Musculoskeletal:Other changes.

TDLo Oral - rat - 2,100 mg/kg

Remarks: Behavioral:Altered sleep time (including change in righting reflex).

Inhalation: no data available

LD50 Dermal - rabbit - 1,200 mg/kg

Remarks: Behavioral:Excitement. Behavioral:Convulsions or effect on seizure threshold. Skin irritation
no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitisation

no data available

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

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

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

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

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

Reproductive toxicity

no data available

no data available

Specific target organ toxicity - single exposure

no data available

Specific target organ toxicity - repeated exposure

no data available

Aspiration hazard

no data available

Additional Information

RTECS: KI0700000

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

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish LC50 - other fish - 1.18 - 9 mg/l - 96.0 h
 LC50 - Lepomis macrochirus (Bluegill) - 0.04 - 0.05 mg/l - 96.0 h
 LC50 - Oncorhynchus mykiss (rainbow trout) - 0.06 - 0.09 mg/l - 96.0 h
 LC50 - Pimephales promelas (fathead minnow) - 3.47 - 5.58 mg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia pulex (Water flea) - 0.01 mg/l - 48 h

12.2 Persistence and degradability

no data available

12.3 Bioaccumulative potential

Indication of bioaccumulation.

12.4 Mobility in soil

no data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

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

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
Marine pollutant: No

Poison Inhalation Hazard: No

IMDG

UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
Marine pollutant: No

IATA

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

SARA 311/312 Hazards

Acute Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	1993-04-24

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H301	Toxic if swallowed.
H312	Harmful in contact with skin.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

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

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.5

Revision Date: 06/13/2014

Print Date: 10/19/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 4,4'-DDT

Product Number : 386340
Brand : Aldrich
Index-No. : 602-045-00-7

CAS-No. : 50-29-3

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301
Acute toxicity, Dermal (Category 3), H311
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Oral (Category 1), H372
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301 + H311 : Toxic if swallowed or in contact with skin.
H351 : Suspected of causing cancer.
H372 : Causes damage to organs through prolonged or repeated exposure if swallowed.
H410 : Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201 : Obtain special instructions before use.
P202 : Do not handle until all safety precautions have been read and

P260	understood.
P264	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P270	Wash skin thoroughly after handling.
P273	Do not eat, drink or smoke when using this product.
P280	Avoid release to the environment.
P281	Wear protective gloves/ protective clothing.
P301 + P310 + P330	Use personal protective equipment as required.
P302 + P352 + P312	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P308 + P313	IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P361	IF exposed or concerned: Get medical advice/ attention.
P363	Remove/Take off immediately all contaminated clothing.
P391	Wash contaminated clothing before reuse.
P405	Collect spillage.
P501	Store locked up.
	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane
1,1-Bis(4-chlorophenyl)-2,2,2-trichloroethane

Formula : C₁₄H₉Cl₅
Molecular weight : 354.49 g/mol
CAS-No. : 50-29-3
EC-No. : 200-024-3
Index-No. : 602-045-00-7

Hazardous components

Component	Classification	Concentration
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	Acute Tox. 3; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H301 + H311, H351, H372, H410	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

- 4.3 Indication of any immediate medical attention and special treatment needed**
No data available

5. FIREFIGHTING MEASURES

- 5.1 Extinguishing media**
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
- 5.2 Special hazards arising from the substance or mixture**
No data available
- 5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.
- 5.4 Further information**
No data available

6. ACCIDENTAL RELEASE MEASURES

- 6.1 Personal precautions, protective equipment and emergency procedures**
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.
- 6.2 Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
- 6.3 Methods and materials for containment and cleaning up**
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.
- 6.4 Reference to other sections**
For disposal see section 13.

7. HANDLING AND STORAGE

- 7.1 Precautions for safe handling**
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.
- 7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects
- 7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	TWA	1 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Confirmed animal carcinogen with unknown relevance to humans		

		TWA	0.5 mg/m ³	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		TWA	1 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		PEL	1 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance

Form: solid

b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 107 - 110 °C (225 - 230 °F) - lit.
f) Initial boiling point and boiling range	260.0 °C (500.0 °F)
g) Flash point	72.0 - 77.0 °C (161.6 - 170.6 °F)
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	0.0000021 hPa (0.0000016 mmHg) at 20.0 °C (68.0 °F)
l) Vapour density	No data available
m) Relative density	0.99 g/cm ³
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 6.91
p) Auto-ignition 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

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

Oxidizing agents, Iron and iron salts.

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 87.0 mg/kg

Inhalation: No data available

LD50 Dermal - Rabbit - 300.0 mg/kg

Remarks: Behavioral:Tremor. Behavioral:Muscle weakness. Behavioral:Ataxia.

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

Limited evidence of carcinogenicity in animal studies

IARC: 2A - Group 2A: Probably carcinogenic to humans (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

IARC: 2A - Group 2A: Probably carcinogenic to humans (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Ingestion - Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard

No data available

Additional Information

RTECS: KJ3325000

CNS stimulation.

Pancreas. -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 0.01 mg/l - 96.0 h LC50 - Lepomis macrochirus (Bluegill) - 0.01 mg/l - 96.0 h LC50 - Oncorhynchus mykiss (rainbow trout) - 0.003400 mg/l - 96.0 h LOEC - Oncorhynchus mykiss (rainbow trout) - 150 mg/l - 3.0 d NOEC - Oncorhynchus mykiss (rainbow trout) - 113 mg/l - 3.0 d
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 0.00108 mg/l - 48 h
Toxicity to algae	LC100 - Scenedesmus quadricauda (Green algae) - > 20 mg/l - 7 d

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 20 d - 0.001 mg/l Bioconcentration factor (BCF): 46,670
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12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)
Reportable Quantity (RQ): 1 lbs Marine pollutant: yes
Poison Inhalation Hazard: No

IMDG

UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)
Marine pollutant: yes

IATA

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
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1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
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Pennsylvania Right To Know Components

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
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1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
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1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
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New Jersey Right To Know Components

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
---	--------------------	-----------------------------

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
---	--------------------	-----------------------------

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer. 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 2008-06-17
--	--------------------	-----------------------------

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 2008-06-17
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WARNING! This product contains a chemical known to the State of California to cause cancer. 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 2008-06-17
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WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 2008-06-17
--	--------------------	-----------------------------

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H301	Toxic if swallowed.
H301 + H311	Toxic if swallowed or in contact with skin.
H311	Toxic in contact with skin.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if swallowed.

HMIS Rating

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

NFPA Rating

Health hazard:	2
Fire Hazard:	2
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
 Product Safety – Americas Region
 1-800-521-8956

Version: 5.6

Revision Date: 05/07/2018

Print Date: 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 4,4'-DDT

Product Number : 386340
Brand : Aldrich
Index-No. : 602-045-00-7

CAS-No. : 50-29-3

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301
Acute toxicity, Dermal (Category 3), H311
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Oral (Category 1), H372
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301 + H311 : Toxic if swallowed or in contact with skin.
H351 : Suspected of causing cancer.
H372 : Causes damage to organs through prolonged or repeated exposure if swallowed.
H410 : Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201 : Obtain special instructions before use.
P202 : Do not handle until all safety precautions have been read and

P260	understood.
P264	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P270	Wash skin thoroughly after handling.
P273	Do not eat, drink or smoke when using this product.
P280	Avoid release to the environment.
P281	Wear protective gloves/ protective clothing.
P301 + P310 + P330	Use personal protective equipment as required.
P302 + P352 + P312	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P308 + P313	IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P361	IF exposed or concerned: Get medical advice/ attention.
P363	Remove/Take off immediately all contaminated clothing.
P391	Wash contaminated clothing before reuse.
P405	Collect spillage.
P501	Store locked up.
	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane
1,1-Bis(4-chlorophenyl)-2,2,2-trichloroethane

Formula : C₁₄H₉Cl₅
Molecular weight : 354.49 g/mol
CAS-No. : 50-29-3
EC-No. : 200-024-3
Index-No. : 602-045-00-7

Hazardous components

Component	Classification	Concentration
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	Acute Tox. 3; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H301 + H311, H351, H372, H410	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

- 4.3 Indication of any immediate medical attention and special treatment needed**
No data available

5. FIREFIGHTING MEASURES

- 5.1 Extinguishing media**
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
- 5.2 Special hazards arising from the substance or mixture**
No data available
- 5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.
- 5.4 Further information**
No data available

6. ACCIDENTAL RELEASE MEASURES

- 6.1 Personal precautions, protective equipment and emergency procedures**
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.
- 6.2 Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
- 6.3 Methods and materials for containment and cleaning up**
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.
- 6.4 Reference to other sections**
For disposal see section 13.

7. HANDLING AND STORAGE

- 7.1 Precautions for safe handling**
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.
- 7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects
- 7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	TWA	1 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Confirmed animal carcinogen with unknown relevance to humans		

		TWA	0.5 mg/m ³	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		TWA	1 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		PEL	1 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance

Form: solid

b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 107 - 110 °C (225 - 230 °F) - lit.
f) Initial boiling point and boiling range	260.0 °C (500.0 °F)
g) Flash point	72.0 - 77.0 °C (161.6 - 170.6 °F)
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	0.0000021 hPa (0.0000016 mmHg) at 20.0 °C (68.0 °F)
l) Vapour density	No data available
m) Relative density	0.99 g/cm ³
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 6.91
p) Auto-ignition 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

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

Oxidizing agents, Iron and iron salts.

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 87.0 mg/kg

Inhalation: No data available

LD50 Dermal - Rabbit - 300.0 mg/kg

Remarks: Behavioral:Tremor. Behavioral:Muscle weakness. Behavioral:Ataxia.

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

Limited evidence of carcinogenicity in animal studies

IARC: 2A - Group 2A: Probably carcinogenic to humans (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

IARC: 2A - Group 2A: Probably carcinogenic to humans (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Ingestion - Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard

No data available

Additional Information

RTECS: KJ3325000

CNS stimulation.

Pancreas. -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 0.01 mg/l - 96.0 h LC50 - Lepomis macrochirus (Bluegill) - 0.01 mg/l - 96.0 h LC50 - Oncorhynchus mykiss (rainbow trout) - 0.003400 mg/l - 96.0 h LOEC - Oncorhynchus mykiss (rainbow trout) - 150 mg/l - 3.0 d NOEC - Oncorhynchus mykiss (rainbow trout) - 113 mg/l - 3.0 d
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 0.00108 mg/l - 48 h
Toxicity to algae	LC100 - Scenedesmus quadricauda (Green algae) - > 20 mg/l - 7 d

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 20 d - 0.001 mg/l Bioconcentration factor (BCF): 46,670
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12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)
Reportable Quantity (RQ): 1 lbs Marine pollutant: yes
Poison Inhalation Hazard: No

IMDG

UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)
Marine pollutant: yes

IATA

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
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1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
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Pennsylvania Right To Know Components

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
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1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
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1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
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New Jersey Right To Know Components

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
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1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
---	--------------------	-----------------------------

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer. 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 2008-06-17
--	--------------------	-----------------------------

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 2008-06-17
--	--------------------	-----------------------------

WARNING! This product contains a chemical known to the State of California to cause cancer. 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 2008-06-17
--	--------------------	-----------------------------

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 2008-06-17
--	--------------------	-----------------------------

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H301	Toxic if swallowed.
H301 + H311	Toxic if swallowed or in contact with skin.
H311	Toxic in contact with skin.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if swallowed.

HMIS Rating

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

NFPA Rating

Health hazard:	2
Fire Hazard:	2
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
 Product Safety – Americas Region
 1-800-521-8956

Version: 5.6

Revision Date: 05/07/2018

Print Date: 06/22/2019

Safety Data Sheet
acc. to OSHA HCS

Printing date 12/07/2015

Reviewed on 12/07/2015

1 Identification

- **Product identifier**
- **Product Name:** 4,6-Dinitro-2-methylphenol
- **Part Number:** S-1700
- **Application of the substance / the mixture** Certified Reference Material
- **Details of the supplier of the safety data sheet**
- **Manufacturer/Supplier:**
SPEX CertiPrep, LLC.
203 Norcross Ave, Metuchen,
NJ 08840 USA
- **Information department:** product safety department
- **Emergency telephone number:**
Emergency Phone Number (24 hours)
CHEMTREC (800-424-9300)
Outside US: 703-527-3887

2 Hazard(s) identification

- **Classification of the substance or mixture**



GHS08 Health hazard

Carc. 2 H351 Suspected of causing cancer.



GHS07

Acute Tox. 4 H302 Harmful if swallowed.

Skin Sens. 1 H317 May cause an allergic skin reaction.

- **Label elements**

- **GHS label elements** The product is classified and labeled according to the Globally Harmonized System (GHS).

- **Hazard pictograms**



GHS07



GHS08

- **Signal word** Warning

- **Hazard-determining components of labeling:**

dichloromethane

DNOC

- **Hazard statements**

Harmful if swallowed.

May cause an allergic skin reaction.

Suspected of causing cancer.

- **Precautionary statements**

Avoid breathing dust/fume/gas/mist/vapors/spray

Wear protective gloves.

Specific treatment (see on this label).

IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.

Store locked up.

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

- **Classification system:**

- **NFPA ratings (scale 0 - 4)**



Health = 2

Fire = 0

Reactivity = 0

(Contd. on page 2)

US

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· **HMIS-ratings (scale 0 - 4)**

HEALTH	2	Health = *2
FIRE	0	Fire = 0
REACTIVITY	0	Reactivity = 0

- **Other hazards**
- **Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.

3 Composition/information on ingredients

- **Chemical characterization: Mixtures**
- **Description:** Mixture of the substances listed below with nonhazardous additions.

· **Dangerous components:**

75-09-2	dichloromethane	99.9%
534-52-1	DNOC	0.1%

4 First-aid measures

- **Description of first aid measures**
- **General information:** Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.
- **After inhalation:**
Supply fresh air. If required, provide artificial respiration. Keep patient warm. Consult doctor if symptoms persist.
In case of unconsciousness place patient stably in side position for transportation.
- **After skin contact:** Generally the product does not irritate the skin.
- **After eye contact:** Rinse opened eye for several minutes under running water.
- **After swallowing:** Immediately call a 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:** CO₂, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
- **Special hazards arising from the substance or mixture** No further relevant information available.
- **Advice for firefighters**
- **Protective equipment:** Mouth respiratory protective device.

6 Accidental release measures

- **Personal precautions, protective equipment and emergency procedures** Not required.
- **Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
- **Methods and material for containment and cleaning up:**
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Dispose contaminated material as waste according to item 13.
Ensure adequate ventilation.
- **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**
Ensure good ventilation/exhaustion at the workplace.
Prevent formation of aerosols.
- **Information about protection against explosions and fires:** No special measures required.

(Contd. on page 3)

Product Name: 4,6-Dinitro-2-methylphenol

(Contd. of page 2)

- **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:** Not required.
- **Further information about storage conditions:** Keep receptacle tightly sealed.
- **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 item 7.
- **Control parameters**

Components with limit values that require monitoring at the workplace:

75-09-2 dichloromethane

PEL	Short-term value: 125 ppm Long-term value: 25 ppm see 29 CFR 1910.1052
REL	See Pocket Guide App. A
TLV	Long-term value: 174 mg/m ³ , 50 ppm BEI

534-52-1 DNOC

PEL	Long-term value: 0.2 mg/m ³ Skin
REL	Long-term value: 0.2 mg/m ³ Skin
TLV	Long-term value: 0.2 mg/m ³ Skin

Ingredients with biological limit values:

75-09-2 dichloromethane

BEI	0.3 mg/L Medium: urine Time: end of shift Parameter: Dichloromethane (semi-quantitative)
-----	---

- **Additional information:** The lists that were valid during the creation were used as basis.
- **Exposure controls**
- **Personal protective equipment:**
- **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Wash hands before breaks and at the end of work.
Avoid contact with the eyes and skin.
- **Breathing equipment:**
In case of brief exposure or low pollution use respiratory filter device. In case of intensive or longer exposure use respiratory protective device that is independent of circulating air.
- **Protection of hands:**



Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.

Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.

Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation

Material of gloves

The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

Penetration time of glove material

The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.

Eye protection: Safety glasses

US

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9 Physical and chemical properties

· Information on basic physical and chemical properties	
· General Information	
· Appearance:	
Form:	Liquid
Color:	According to product specification
· Odor:	Characteristic
· Odour Threshold:	Not applicable.
· pH-value:	Not applicable.
· Change in condition	
Melting point/Melting range:	Undetermined.
Boiling point/Boiling range:	40 °C (104 °F)
· Flash point:	Not applicable.
· Flammability (solid, gaseous):	Not applicable.
· Ignition temperature:	
Decomposition temperature:	Not applicable.
· Auto igniting:	Product is not selfigniting.
· Danger of explosion:	Product does not present an explosion hazard.
· Explosion limits:	
Lower:	Not applicable.
Upper:	Not applicable.
· Vapor pressure:	Not determined.
· Density at 20 °C (68 °F)	0.78921 g/cm ³ (6.586 lbs/gal)
· Relative density	Not applicable.
· Vapour density	Not applicable.
· Evaporation rate	Not applicable.
· Solubility in / Miscibility with	
Water:	Not miscible or difficult to mix.
· Partition coefficient (n-octanol/water): Not applicable.	
· Viscosity:	
Dynamic:	Not applicable.
Kinematic:	Not applicable.
· Solvent content:	
Organic solvents:	99.9 %
Solids content:	0.1 %
· Other information	No further relevant information available.

10 Stability and reactivity

- **Reactivity** No further relevant information available.
- **Chemical stability**
- **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
- **Possibility of hazardous reactions** No dangerous reactions known.
- **Conditions to avoid** No further relevant information available.
- **Incompatible materials:** No further relevant information available.
- **Hazardous decomposition products:** No dangerous decomposition products known.

11 Toxicological information

- **Information on toxicological effects**
- **Acute toxicity:**

· **LD/LC50 values that are relevant for classification:**

75-09-2 dichloromethane

Oral	LD50	1600 mg/kg (rat)
Inhalative	LC50/4 h	88 mg/l (rat)

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534-52-1 DNOC

Oral	LD50	10 mg/kg (rat)
Dermal	LD50	1000 mg/kg (rabbit)

- **Primary irritant effect:**
- **on the skin:** No irritant effect.
- **on the eye:** No irritating effect.
- **Sensitization:** No sensitizing effects known.
- **Additional toxicological information:**
The product shows the following dangers according to internally approved calculation methods for preparations:
Harmful
- **Carcinogenic categories**

· **IARC (International Agency for Research on Cancer)**

75-09-2	dichloromethane	2B
---------	-----------------	----

· **NTP (National Toxicology Program)**

75-09-2	dichloromethane	R
---------	-----------------	---

· **OSHA-Ca (Occupational Safety & Health Administration)**

75-09-2	dichloromethane	
---------	-----------------	--

12 Ecological information

- **Toxicity**
- **Aquatic toxicity:** No further relevant information available.
- **Persistence and degradability:** No further relevant information available.
- **Behavior in environmental systems:**
- **Bioaccumulative potential:** No further relevant information available.
- **Mobility in soil:** No further relevant information available.
- **Additional ecological information:**
- **General notes:**
Water hazard class 2 (Self-assessment): hazardous for water
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.
- **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:** Must not be disposed of together with household garbage. Do not allow product to reach sewage system.
- **Uncleaned packagings:**
- **Recommendation:** Disposal must be made according to official regulations.

14 Transport information

· UN-Number	
· DOT, ADR, IMDG, IATA	UN1593
· UN proper shipping name	
· DOT	Dichloromethane
· ADR	1593 Dichloromethane
· IMDG, IATA	DICHLOROMETHANE

· **Transport hazard class(es)**· **DOT**

· **Class** 6.1 Toxic substances

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Product Name: 4,6-Dinitro-2-methylphenol

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· Label	6.1
· ADR, IMDG, IATA	
	
· Class	6.1 Toxic substances
· Label	6.1
· Packing group	
· DOT, ADR, IMDG, IATA	III
· Environmental hazards:	Not applicable.
· Special precautions for user	Warning: Toxic substances
· Danger code (Kemler):	60
· EMS Number:	F-A,S-A
· Segregation groups	Liquid halogenated hydrocarbons
· Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
· Transport/Additional information:	
· ADR	
· Excepted quantities (EQ)	Code: E1 Maximum net quantity per inner packaging: 30 ml Maximum net quantity per outer packaging: 1000 ml
· IMDG	
· Limited quantities (LQ)	5L
· Excepted quantities (EQ)	Code: E1 Maximum net quantity per inner packaging: 30 ml Maximum net quantity per outer packaging: 1000 ml
· UN "Model Regulation":	UN 1593 DICHLOROMETHANE, 6.1, III, (E)

15 Regulatory information

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**

· **Sara**

· **Section 355 (extremely hazardous substances):**

534-52-1 DNOC

· **Section 313 (Specific toxic chemical listings):**

All ingredients are listed.

· **TSCA (Toxic Substances Control Act):**

All ingredients are listed.

· **Proposition 65**

· **Chemicals known to cause cancer:**

75-09-2 dichloromethane

· **Chemicals known to cause reproductive toxicity for females:**

None of the ingredients is listed.

· **Chemicals known to cause reproductive toxicity for males:**

None of the ingredients is listed.

· **Chemicals known to cause developmental toxicity:**

None of the ingredients is listed.

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**

75-09-2 dichloromethane

L

· **TLV (Threshold Limit Value established by ACGIH)**

75-09-2 dichloromethane

A3

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

75-09-2 dichloromethane

· **GHS label elements** The product is classified and labeled according to the Globally Harmonized System (GHS).

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Product Name: 4,6-Dinitro-2-methylphenol

(Contd. of page 6)

· Hazard pictograms



GHS07

GHS08

· Signal word Warning

· Hazard-determining components of labeling:

dichloromethane

DNOC

· Hazard statements

Harmful if swallowed.

May cause an allergic skin reaction.

Suspected of causing cancer.

· Precautionary statements

Avoid breathing dust/fume/gas/mist/vapors/spray

Wear protective gloves.

Specific treatment (see on this label).

IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.

Store locked up.

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

· Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· Department issuing SDS: product safety department

· Contact:

SPEX CertiPrep, LLC.

1-732-549-7144

· Date of preparation / last revision 12/07/2015 / -

· 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

ACGIH: American Conference of Governmental Industrial Hygienists

EINECS: European Inventory of Existing Commercial Chemical Substances

ELINCS: European List of Notified Chemical Substances

CAS: Chemical Abstracts Service (division of the American Chemical Society)

NFPA: National Fire Protection Association (USA)

HMIS: Hazardous Materials Identification System (USA)

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

PBT: Persistent, Bioaccumulative and Toxic

vPvB: very Persistent and very Bioaccumulative

Acute Tox. 4: Acute toxicity, Hazard Category 4

Skin Sens. 1: Sensitisation - Skin, Hazard Category 1

Carc. 2: Carcinogenicity, Hazard Category 2

SAFETY DATA SHEET

Version 3.9
Revision Date 08/10/2016
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : 4-Methylphenol

Product Number : 442418
Brand : Supelco
Index-No. : 604-004-00-9

CAS-No. : 106-44-5

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301
Acute toxicity, Dermal (Category 3), H311
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H301 + H311 : Toxic if swallowed or in contact with skin
H314 : Causes severe skin burns and eye damage.
H318 : Causes serious eye damage.
H411 : Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P260 : Do not breathe dust or mist.
P264 : Wash skin thoroughly after handling.

P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : *p*-Cresol
4-Methylphenol

Formula : C₇H₈O
Molecular weight : 108.14 g/mol
CAS-No. : 106-44-5
EC-No. : 203-398-6
Index-No. : 604-004-00-9

Hazardous components

Component	Classification	Concentration
p-Cresol	Acute Tox. 3; Skin Corr. 1B; Eye Dam. 1; Aquatic Acute 2; Aquatic Chronic 2; H301 + H311, H314, H411	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

If swallowed

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

- 4.2 Most important symptoms and effects, both acute and delayed**
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11
- 4.3 Indication of any immediate medical attention and special treatment needed**
No data available
-

5. FIREFIGHTING MEASURES

- 5.1 Extinguishing media**
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
- 5.2 Special hazards arising from the substance or mixture**
No data available
- 5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.
- 5.4 Further information**
No data available
-

6. ACCIDENTAL RELEASE MEASURES

- 6.1 Personal precautions, protective equipment and emergency procedures**
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.
- 6.2 Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
- 6.3 Methods and materials for containment and cleaning up**
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.
- 6.4 Reference to other sections**
For disposal see section 13.
-

7. HANDLING AND STORAGE

- 7.1 Precautions for safe handling**
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.
- 7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place.
hygroscopic Air and light sensitive. Handle and store under inert gas.
- 7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated
-

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

- 8.1 Control parameters**
Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
p-Cresol	106-44-5	TWA	2.3 ppm 10 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	5 ppm 22 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Skin designation The value in mg/m3 is approximate.		
		TWA	20 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Not classifiable as a human carcinogen Danger of cutaneous absorption		
		PEL	5 ppm 22 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 480 min

Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.2 mm

Break through time: 30 min

Material tested:Dermatril® P (KCL 743 / Aldrich Z677388, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance	Form: crystalline Colour: colourless
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 32 - 34 °C (90 - 93 °F) - lit.
f) Initial boiling point and boiling range	202 °C (396 °F) - lit.
g) Flash point	85.0 °C (185.0 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	Lower explosion limit: 1.1 %(V)
k) Vapour pressure	1.3 hPa (1.0 mmHg) at 20.0 °C (68.0 °F)
l) Vapour density	No data available
m) Relative density	1.034 g/mL at 25 °C (77 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 1.94
p) Auto-ignition temperature	559.0 °C (1,038.2 °F)
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety information

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

Oxidizing agents, Bases

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 207.0 mg/kg

Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Olfaction:Other changes.

Behavioral:Convulsions or effect on seizure threshold. Gastrointestinal:Ulceration or bleeding from stomach.

LC50 Inhalation - Rat - 1 h - > 710 mg/m³

LD50 Dermal - Rabbit - 301.0 mg/kg

Remarks: Behavioral:Tremor. Gastrointestinal:Changes in structure or function of salivary glands. Kidney, Ureter, Bladder:Other changes.

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Severe skin irritation - 24 h

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Severe eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

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

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: GO6475000

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, laryngitis, Dizziness, Cardiovascular effects., Muscle cramps/spasms., Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

Kidney -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - other fish - 16.00 - 24.00 mg/l - 24 h
LC50 - Oncorhynchus mykiss (rainbow trout) - 7.9 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates LC50 - Daphnia magna (Water flea) - 1.4 mg/l - 48 h

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3455 Class: 6.1 (8) Packing group: II
Proper shipping name: Cresols, solid
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 3455 Class: 6.1 (8) Packing group: II EMS-No: F-A, S-B
Proper shipping name: CRESOLS, SOLID

IATA

UN number: 3455 Class: 6.1 (8) Packing group: II
Proper shipping name: Cresols, solid

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:
CAS-No. Revision Date

p-Cresol 106-44-5 2007-07-01

SARA 311/312 Hazards

Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
p-Cresol	106-44-5	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
p-Cresol	106-44-5	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
p-Cresol	106-44-5	2007-07-01

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Eye Dam.	Serious eye damage
H301	Toxic if swallowed.
H301 + H311	Toxic if swallowed or in contact with skin
H311	Toxic in contact with skin.
H314	Causes severe skin burns and eye damage.

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	3
Fire Hazard:	2
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.9

Revision Date: 08/10/2016

Print Date: 06/28/2019

SAFETY DATA SHEET

1H,1H,2H,2H-TRIDECAFLUOROOCANE-1-SULPHONIC ACID

Page: 1

Compilation date: 14/07/2007

Revision date: 30/12/2013

Revision No: 3

Section 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name: 1H,1H,2H,2H-TRIDECAFLUOROOCANE-1-SULPHONIC ACID

CAS number: 27619-97-2

Product code: PC6143

Synonyms: 3,3,4,4,5,5,6,6,7,7,8,8,8-TRIDECAFLUOROOCANE-1-SULPHONIC ACID, 1H,1H,2H,2H-PERFLUOROOCANE-2-(PERFLUOROHEX-1-YL)ETHANE-1-SUPHONIC ACID

1.2. Relevant identified uses of the substance or mixture and uses advised against

1.3. Details of the supplier of the safety data sheet

Company name: Apollo Scientific Ltd

Units 3 & 4

Parkway

Denton

Manchester

M34 3SG

UK

Tel: 0161 337 9971

Fax: 0161 336 6932

Email: david.tideswell@apolloscientific.co.uk

1.4. Emergency telephone number

Section 2: Hazards identification

2.1. Classification of the substance or mixture

Classification under CHIP: C: R34

Classification under CLP: Skin Corr. 1B: H314

Most important adverse effects: Causes burns.

2.2. Label elements

Label elements under CLP:

Hazard statements: H314: Causes severe skin burns and eye damage.

Signal words: Danger

Hazard pictograms: GHS05: Corrosion



SAFETY DATA SHEET

1H,1H,2H,2H-TRIDECAFLUOROOCCTANE-1-SULPHONIC ACID

Page: 2

Precautionary statements: P280: Wear protective gloves/protective clothing/eye protection/face protection.
P309+311: IF exposed or if you feel unwell: Call a POISON CENTER or doctor.

Label elements under CHIP:

Hazard symbols: Corrosive.



Risk phrases: R34: Causes burns.

Safety phrases: S22: Do not breathe dust.

S24/25: Avoid contact with skin and eyes.

S36/37/39: Wear suitable protective clothing, gloves and eye / face protection.

S45: In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

2.3. Other hazards

PBT: This substance is not identified as a PBT substance.

Section 3: Composition/information on ingredients

3.1. Substances

Chemical identity: 1H,1H,2H,2H-TRIDECAFLUOROOCCTANE-1-SULPHONIC ACID

Section 4: First aid measures

4.1. Description of first aid measures

Skin contact: Remove all contaminated clothes and footwear immediately unless stuck to skin. Drench the affected skin with running water for 10 minutes or longer if substance is still on skin. Transfer to hospital if there are burns or symptoms of poisoning.

Eye contact: Bathe the eye with running water for 15 minutes. Transfer to hospital for specialist examination.

Ingestion: Wash out mouth with water. Do not induce vomiting. Give 1 cup of water to drink every 10 minutes. If unconscious, check for breathing and apply artificial respiration if necessary. If unconscious and breathing is OK, place in the recovery position. Transfer to hospital as soon as possible.

Inhalation: Remove casualty from exposure ensuring one's own safety whilst doing so. If unconscious and breathing is OK, place in the recovery position. If conscious, ensure the casualty sits or lies down. If breathing becomes bubbly, have the casualty sit and provide oxygen if available. Transfer to hospital as soon as possible.

4.2. Most important symptoms and effects, both acute and delayed

Skin contact: Blistering may occur. Progressive ulceration will occur if treatment is not immediate.

Eye contact: Corneal burns may occur. May cause permanent damage.

Ingestion: Corrosive burns may appear around the lips. Blood may be vomited. There may be bleeding from the mouth or nose.

[cont...]

SAFETY DATA SHEET

1H,1H,2H,2H-TRIDECAFLUOROOCANE-1-SULPHONIC ACID

Page: 3

Inhalation: There may be shortness of breath with a burning sensation in the throat. Exposure may cause coughing or wheezing.

4.3. Indication of any immediate medical attention and special treatment needed

Section 5: Fire-fighting measures

5.1. Extinguishing media

Extinguishing media: Carbon dioxide, dry chemical powder, foam. Suitable extinguishing media for the surrounding fire should be used. Use water spray to cool containers.

5.2. Special hazards arising from the substance or mixture

Exposure hazards: Corrosive. In combustion emits toxic fumes of carbon dioxide / carbon monoxide. Hydrogen fluoride (HF). Sulphur oxides (SO_x).

5.3. Advice for fire-fighters

Advice for fire-fighters: Wear self-contained breathing apparatus. Wear protective clothing to prevent contact with skin and eyes.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions: Notify the police and fire brigade immediately. If outside keep bystanders upwind and away from danger point. Mark out the contaminated area with signs and prevent access to unauthorised personnel. Do not attempt to take action without suitable protective clothing - see section 8 of SDS. Do not create dust.

6.2. Environmental precautions

Environmental precautions: Do not discharge into drains or rivers.

6.3. Methods and material for containment and cleaning up

Clean-up procedures: Clean-up should be dealt with only by qualified personnel familiar with the specific substance. Transfer to a closable, labelled salvage container for disposal by an appropriate method.

6.4. Reference to other sections

Section 7: Handling and storage

7.1. Precautions for safe handling

Handling requirements: Avoid direct contact with the substance. Ensure there is sufficient ventilation of the area. Do not handle in a confined space. Avoid the formation or spread of dust in the air. Only use in fume hood.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions: Store in cool, well ventilated area. Keep container tightly closed.

Suitable packaging: Must only be kept in original packaging.

[cont...]

SAFETY DATA SHEET

1H,1H,2H,2H-TRIDECAFLUOROCTANE-1-SULPHONIC ACID

Page: 4

7.3. Specific end use(s)

Specific end use(s): No data available.

Section 8: Exposure controls/personal protection

8.1. Control parameters

Workplace exposure limits: No data available.

8.2. Exposure controls

Engineering measures: Ensure there is sufficient ventilation of the area.

Respiratory protection: Self-contained breathing apparatus must be available in case of emergency. Respiratory protective device with particle filter.

Hand protection: Protective gloves.

Eye protection: Tightly fitting safety goggles. Ensure eye bath is to hand.

Skin protection: Protective clothing.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

State: Solid

Colour: White to off white

Oxidising: Non-oxidising (by EC criteria)

Melting point/range °C: >300 (dec)

9.2. Other information

Other information: No data available.

Section 10: Stability and reactivity

10.1. Reactivity

Reactivity: Stable under recommended transport or storage conditions.

10.2. Chemical stability

Chemical stability: Stable under normal conditions.

10.3. Possibility of hazardous reactions

Hazardous reactions: Hazardous reactions will not occur under normal transport or storage conditions.

10.4. Conditions to avoid

Conditions to avoid: Heat.

10.5. Incompatible materials

Materials to avoid: Strong oxidising agents. Strong acids.

10.6. Hazardous decomposition products

Haz. decomp. products: In combustion emits toxic fumes of carbon dioxide / carbon monoxide. Sulphur oxides (SOx) Hydrogen fluoride (HF).

[cont...]

SAFETY DATA SHEET

1H,1H,2H,2H-TRIDECAFLUOROCTANE-1-SULPHONIC ACID

Page: 5

Section 11: Toxicological information

11.1. Information on toxicological effects

Relevant hazards for substance:

Hazard	Route	Basis
Skin corrosion/irritation	DRM	Based on test data
Serious eye damage/irritation	OPT	Based on test data

Symptoms / routes of exposure

Skin contact: Blistering may occur. Progressive ulceration will occur if treatment is not immediate.

Eye contact: Corneal burns may occur. May cause permanent damage.

Ingestion: Corrosive burns may appear around the lips. Blood may be vomited. There may be bleeding from the mouth or nose.

Inhalation: There may be shortness of breath with a burning sensation in the throat. Exposure may cause coughing or wheezing.

Section 12: Ecological information

12.1. Toxicity

Ecotoxicity values: No data available.

12.2. Persistence and degradability

Persistence and degradability: No data available.

12.3. Bioaccumulative potential

Bioaccumulative potential: No data available.

12.4. Mobility in soil

Mobility: No data available.

12.5. Results of PBT and vPvB assessment

PBT identification: This substance is not identified as a PBT substance.

12.6. Other adverse effects

Other adverse effects: No data available.

Section 13: Disposal considerations

13.1. Waste treatment methods

Disposal operations: MATERIAL SHOULD BE DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS

Disposal of packaging: Dispose of as special waste in compliance with local and national regulations Observe all federal, state and local environmental regulations.

NB: The user's attention is drawn to the possible existence of regional or national regulations regarding disposal.

[cont...]

SAFETY DATA SHEET

1H,1H,2H,2H-TRIDECAFLUOROOCANE-1-SULPHONIC ACID

Page: 6

Section 14: Transport information

14.1. UN number

UN number: UN3261

14.2. UN proper shipping name

Shipping name: CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S.

14.3. Transport hazard class(es)

Transport class: 8

14.4. Packing group

Packing group: III

14.5. Environmental hazards

Environmentally hazardous: No

Marine pollutant: No

14.6. Special precautions for user

Section 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.2. Chemical Safety Assessment

Chemical safety assessment: A chemical safety assessment has not been carried out for the substance or the mixture by the supplier.

Section 16: Other information

Other information

Other information: This safety data sheet is prepared in accordance with Commission Regulation (EU) No 453/2010.

* Data predicted using computational software. Toxtree - Toxic Hazard Estimation by decision tree approach. [http://ecb.jrc.ec.europa.eu/qsar/qsar-tools/index.php?](http://ecb.jrc.ec.europa.eu/qsar/qsar-tools/index.php?c=TOXTREE)
c=TOXTREE

~ Data predicted using computational software ACD/ToxSuite v 2.95.1 Copyright 1994-2009 ACD/labs, Copyright 2001-2009 Pharma Algorithms, Inc, Advanced Chemistry Development, Inc (ACD/Labs). http://www.acdlabs.com/products/pc_admet/tox/tox/

Phrases used in s.2 and 3: H314: Causes severe skin burns and eye damage.
R34: Causes burns.

Legal disclaimer: The material is intended for research purposes only and should be handled exclusively by those who have been fully trained in safety, laboratory and chemical handling procedures. The above information is believed to be correct to the best of our knowledge. The above information is believed to be correct to the best of our knowledge at the date of its publication, but should not be considered to be all inclusive. It should

[cont...]

SAFETY DATA SHEET

1H,1H,2H,2H-TRIDECAFLUOROOCTANE-1-SULPHONIC ACID

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be used only as a guide for safe handling, storage, transportation and disposal. We cannot guarantee that the hazards detailed in this document are the only hazards that exist for this product. This is not a warranty and Apollo Scientific Ltd shall not be held liable for any damage resulting from handling or from contact with the above product.

SAFETY DATA SHEET

Version 6.1
Revision Date 05/07/2019
Print Date 06/28/2019**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Acenaphthene

Product Number : 215376
Brand : Aldrich
CAS-No. : 83-32-9**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 sheetCompany : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATESTelephone : +1 314 771-5765
Fax : +1 800 325-5052**1.4 Emergency telephone number**

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Warning

Hazard statement(s)
H315 : Causes skin irritation.

H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	1,8-Ethylenenaphthalene
Formula	:	C ₁₂ H ₁₀
Molecular weight	:	154.21 g/mol
CAS-No.	:	83-32-9
EC-No.	:	201-469-6

Component	Classification	Concentration
Acenaphthene		
	Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; Aquatic Acute 1; Aquatic Chronic 1; H315, H319, H335, H400, H410 M-Factor - Aquatic Acute: 10	<= 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

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

If inhaled

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

In case of skin contact

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

In case of eye contact

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

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): 11: Combustible Solids

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

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: solid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 90 - 94 °C (194 - 201 °F) - lit. |
| f) Initial boiling point and boiling range | 279 °C 534 °F - lit. |
| g) Flash point | 125.0 °C (257.0 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 13.3 hPa at 131.0 °C (267.8 °F) |
| l) Vapour density | No data available |
| m) Relative density | No data available |

- | | | |
|----|---|----------------------|
| n) | Water solubility | No data available |
| o) | Partition coefficient:
n-octanol/water | log Pow: 3.39 - 4.19 |
| p) | Auto-ignition
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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Rat - 600 mg/kg

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: AB1000000

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

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.67 mg/l - 96.0 h LC50 - Pimephales promelas (fathead minnow) - 0.6 - 1.73 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 1.27 - 3.45 mg/l - 48 h
Toxicity to algae	EC50 - Pseudokirchneriella subcapitata (green algae) - 0.52 - 0.53 mg/l - 96 h

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation Lepomis macrochirus (Bluegill) - 28 d
- 0.00894 mg/l(Acenaphthene)

Bioconcentration factor (BCF): 387

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

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

Very toxic to aquatic life with long lasting effects.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Acenaphthene)
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
(Acenaphthene)
Marine pollutant : yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Acenaphthene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

SECTION 15: Regulatory information

SARA 302 Components

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

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

Acute Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Acenaphthene

CAS-No.
83-32-9

Revision Date
1993-02-16

SECTION 16: Other information

Further information

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

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Version: 6.1

Revision Date: 05/07/2019

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 5.6
Revision Date 05/24/2016
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Acenaphthylene

Product Number : 416703
Brand : Aldrich

CAS-No. : 208-96-8

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

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

Warning

Hazard statement(s)

H302

Harmful if swallowed.

H315

Causes skin irritation.

H319

Causes serious eye irritation.

H335

May cause respiratory irritation.

Precautionary statement(s)

P261

Avoid breathing dust/ fume/ gas/ mist/ vapours/ 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 eye protection/ face protection.

P280	Wear protective gloves.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	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.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash 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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₁₂ H ₈
Molecular weight	: 152.19 g/mol
CAS-No.	: 208-96-8
EC-No.	: 205-917-1

Hazardous components

Component	Classification	Concentration
Acenaphthylene		
	Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; H302, H315, H319, H335	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

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

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

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

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: solid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 78 - 82 °C (172 - 180 °F) - lit. |
| f) Initial boiling point and boiling range | 280 °C (536 °F) - lit. |
| g) Flash point | 122.0 °C (251.6 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | 0.899 g/mL at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition 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

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

Oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Mouse - 1,760 mg/kg

Remarks: Autonomic Nervous System:Other (direct) parasympathomimetic. Respiratory disorder Blood: Hemorrhage.

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

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

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

known or anticipated carcinogen by NTP.

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

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

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

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: AB1254000

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

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077

Class: 9

Packing group: III

Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Acenaphthylene)

Reportable Quantity (RQ): 5000 lbs

Poison Inhalation Hazard: No

IMDG

Not dangerous goods

IATA

Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Acenaphthylene	208-96-8	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Acenaphthylene	208-96-8	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Acenaphthylene	208-96-8	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer.	208-96-8	2007-09-28

Acenaphthylene

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer.	208-96-8	2007-09-28

Acenaphthylene

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Eye Irrit.	Eye irritation
H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
Skin Irrit.	Skin irritation

HMIS Rating

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

NFPA Rating

Health hazard:	2
----------------	---

Fire Hazard: 1
Reactivity Hazard: 0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.6

Revision Date: 05/24/2016

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 4.9
Revision Date 06/02/2016
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Acetone

Product Number : W332615
Brand : Aldrich
Index-No. : 606-001-00-8

CAS-No. : 67-64-1

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 2), H225
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H225 Highly flammable liquid and vapour.
H319 Causes serious eye irritation.
H336 May cause drowsiness or dizziness.

Precautionary statement(s)

P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233 Keep container tightly closed.
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242 Use only non-sparking tools.
P243 Take precautionary measures against static discharge.

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₃ H ₆ O
Molecular weight	: 58.08 g/mol
CAS-No.	: 67-64-1
EC-No.	: 200-662-2
Index-No.	: 606-001-00-8
Registration number	: 01-2119471330-49-XXXX

Hazardous components

Component	Classification	Concentration
Acetone		
	Flam. Liq. 2; Eye Irrit. 2A; STOT SE 3; H225, H319, H336	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

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

If swallowed

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

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

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

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

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

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

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Storage class (TRGS 510): Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Acetone	67-64-1	TWA	500.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Hematologic effects Upper Respiratory Tract irritation Eye irritation Adopted values or notations enclosed are those for which changes are proposed in the NIC		

		See Notice of Intended Changes (NIC) Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	250 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation 2015 Adoption Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	750.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Hematologic effects Upper Respiratory Tract irritation Eye irritation Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	500 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation 2015 Adoption Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	1,000.000000 ppm 2,400.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	250.000000 ppm 590.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		STEL	750 ppm 1,780 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	3,000 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	500 ppm 1,200 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Acetone	67-64-1	Acetone	50.0000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)

	Remarks	End of shift (As soon as possible after exposure ceases)			
		Acetone	25 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

Derived No Effect Level (DNEL)

Application Area	Exposure routes	Health effect	Value
Workers	Skin contact	Long-term systemic effects	186mg/kg BW/d
Consumers	Ingestion	Long-term systemic effects	62mg/kg BW/d
Consumers	Skin contact	Long-term systemic effects	62mg/kg BW/d
Workers	Inhalation	Acute systemic effects	2420 mg/m3
Workers	Inhalation	Long-term systemic effects	1210 mg/m3
Consumers	Inhalation	Long-term systemic effects	200 mg/m3

Predicted No Effect Concentration (PNEC)

Compartment	Value
Soil	33.3 mg/kg
Marine water	1.06 mg/l
Fresh water	10.6 mg/l
Marine sediment	3.04 mg/kg
Fresh water sediment	30.4 mg/kg
Onsite sewage treatment plant	100 mg/l

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 480 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 480 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: liquid, clear
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -94 °C (-137 °F) - lit. |
| f) Initial boiling point and boiling range | 56 °C (133 °F) at 1,013 hPa (760 mmHg) - lit. |
| g) Flash point | -17.0 °C (1.4 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 13 %(V)
Lower explosion limit: 2 %(V) |
| k) Vapour pressure | 533.3 hPa (400.0 mmHg) at 39.5 °C (103.1 °F)
245.3 hPa (184.0 mmHg) at 20.0 °C (68.0 °F) |
| l) Vapour density | No data available |
| m) Relative density | 0.791 g/cm ³ at 25 °C (77 °F) |
| n) Water solubility | completely miscible |
| o) Partition coefficient: n-octanol/water | log Pow: -0.24 |
| p) Auto-ignition temperature | 465.0 °C (869.0 °F) |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety information

- | | |
|-----------------|--------------------------------|
| Surface tension | 23.2 mN/m at 20.0 °C (68.0 °F) |
|-----------------|--------------------------------|

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Bases, Oxidizing agents, Reducing agents, Acetone reacts violently with phosphorous oxychloride.

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 5,800 mg/kg

Remarks: Behavioral:Altered sleep time (including change in righting reflex). Behavioral:Tremor. Behavioral:Headache. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.

LC50 Inhalation - Rat - 8 h - 50,100 mg/m³

Remarks: Drowsiness Dizziness Unconsciousness

LD50 Dermal - Guinea pig - 7,426 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Mild skin irritation - 24 h

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Eye irritation - 24 h

Respiratory or skin sensitisation

- Guinea pig

Result: Does not cause skin sensitisation.

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

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

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

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

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: AL3150000

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

Kidney - Irregularities - Based on Human Evidence

Skin - Dermatitis - Based on Human Evidence

Kidney - Irregularities - Based on Human Evidence

Skin - Dermatitis - Based on Human Evidence

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish LC50 - Oncorhynchus mykiss (rainbow trout) - 5,540 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates LC50 - Daphnia magna (Water flea) - 8,800 mg/l - 48 h

Toxicity to algae Remarks: No data available

12.2 Persistence and degradability

Biodegradability Result: 91 % - Readily biodegradable (OECD Test Guideline 301B)

12.3 Bioaccumulative potential

Does not bioaccumulate.

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

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

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

Contaminated packaging

Dispose of as unused product.

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

UN number: 1090 Class: 3 Packing group: II

Proper shipping name: Acetone

Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1090 Class: 3 Packing group: II EMS-No: F-E, S-D

Proper shipping name: ACETONE

IATA

UN number: 1090 Class: 3
Proper shipping name: Acetone

Packing group: II

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Acetone	67-64-1	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Acetone	67-64-1	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Acetone	67-64-1	2007-03-01

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
STOT SE	Specific target organ toxicity - single exposure

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

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

Version: 4.9

Revision Date: 06/02/2016

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 05/25/2018
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Acetophenone

Product Number : 42163
Brand : Sigma-Aldrich
Index-No. : 606-042-00-1

CAS-No. : 98-86-2

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 4), H227

Acute toxicity, Oral (Category 4), H302

Eye irritation (Category 2A), H319

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 : Warning

Hazard statement(s)
H227 : Combustible liquid.
H302 : Harmful if swallowed.
H319 : Causes serious eye irritation.

Precautionary statement(s)	
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Methyl phenyl ketone
Molecular weight	:	120.15 g/mol
CAS-No.	:	98-86-2
EC-No.	:	202-708-7
Index-No.	:	606-042-00-1

Hazardous components

Component	Classification	Concentration
Acetophenone		
	Flam. Liq. 4; Acute Tox. 4; Eye Irrit. 2A; H227, H302, H319	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

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

If swallowed

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

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

Unsuitable extinguishing media

Do NOT use water jet.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

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

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

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

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

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Light sensitive. Store under inert gas.

Storage class (TRGS 510): 10: Combustible liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Acetophenone	98-86-2	TWA	10.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Upper Respiratory Tract irritation Pregnancy loss		

		TWA	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Pregnancy loss		
		TWA	10.000000 ppm	USA. Workplace Environmental Exposure Levels (WEEL)
		TWA	10 ppm	USA. Workplace Environmental Exposure Levels (WEEL)
		PEL	10 ppm 49 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 480 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact

Material: Nature latex/chloroprene

Minimum layer thickness: 0.6 mm

Break through time: 30 min

Material tested: Lapren® (KCL 706 / Aldrich Z677558, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---------------|---|
| a) Appearance | Form: clear, liquid
Colour: colourless |
| b) Odour | No data available |

c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 19 - 20 °C (66 - 68 °F) - lit.
f) Initial boiling point and boiling range	202 °C (396 °F) - lit.
g) Flash point	76 °C (169 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	Upper explosion limit: 5.2 %(V) Lower explosion limit: 1.4 %(V)
k) Vapour pressure	1 hPa at 15 °C (59 °F)
l) Vapour density	4.15 - (Air = 1.0)
m) Relative density	1.03 g/cm ³ at 25 °C (77 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 1.6
p) Auto-ignition 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

Relative vapour density 4.15 - (Air = 1.0)

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents, Strong bases, Strong reducing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 815 mg/kg
Inhalation: No data available
LD50 Dermal - Rabbit - 16,329 mg/kg
No data available

Skin corrosion/irritation

Skin - Rabbit
Result: Mild skin irritation
(Draize Test)

Serious eye damage/eye irritation

Eyes - Rabbit
Result: Irritating to eyes.

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Hamster
Lungs
Cytogenetic analysis

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available
No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: AM5250000

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 162 mg/l - 96h(Acetophenone)
------------------	--

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(Acetophenone)

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

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

UN number: 3334

Class: 9

Packing group: III

Proper shipping name: Aviation regulated liquid, n.o.s. (Acetophenone)

15. REGULATORY INFORMATION

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

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

	CAS-No.	Revision Date
Acetophenone	98-86-2	1993-04-24

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Acetophenone	98-86-2	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Acetophenone	98-86-2	1993-04-24

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H227 Combustible liquid.
H302 Harmful if swallowed.
H319 Causes serious eye irritation.

HMIS Rating

Health hazard: 2
Chronic Health Hazard: /
Flammability: 2
Physical Hazard 0

NFPA Rating

Health hazard: 2
Fire Hazard: 2
Reactivity Hazard: 0

Further information

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

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1

Revision Date: 05/25/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 4.9
Revision Date 05/27/2016
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Aluminum

Product Number : 11009
Brand : Aldrich
Index-No. : 013-002-00-1

CAS-No. : 7429-90-5

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture**

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable solids (Category 1), H228

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)
H228 : Flammable solid.

Precautionary statement(s)
P210 : Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P240 : Ground/bond container and receiving equipment.
P241 : Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P280 : Wear protective gloves/ eye protection/ face protection.
P370 + P378 : In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Combustible dust

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula : Al
Molecular weight : 26.98 g/mol
CAS-No. : 7429-90-5
EC-No. : 231-072-3
Index-No. : 013-002-00-1
Registration number : 01-2119529243-45-XXXX

Hazardous components

Component	Classification	Concentration
	Flam. Sol. 1; H228	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Special powder against metal fire Dry sand Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Unsuitable extinguishing media

Water Carbon dioxide (CO₂) ABC powder

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. Keep in suitable, closed containers for disposal. Contain spillage, pick up with an electrically protected vacuum cleaner or by wet-brushing and transfer to a container for disposal according to local regulations (see section 13). Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal. Contain spillage, pick up with an electrically protected vacuum cleaner or by wet-brushing and transfer to a container for disposal according to local regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Store in original container. Do not store near combustible materials. Keep in a cool place away from acids. Keep in a cool place away from bases. Keep in a cool place away from oxidizing agents. Keep container tightly closed in a dry and well-ventilated place.

Handle and store under inert gas. Keep in a dry place.

Storage class (TRGS 510): Flammable solid hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
	7429-90-5	TWA	1.000000 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Lower Respiratory Tract irritation Pneumoconiosis Neurotoxicity Not classifiable as a human carcinogen		

		TWA	15.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	15.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Lower Respiratory Tract irritation Pneumoconiosis Neurotoxicity Not classifiable as a human carcinogen varies		
		TWA	1.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Lower Respiratory Tract irritation Pneumoconiosis Neurotoxicity Not classifiable as a human carcinogen varies		
		TWA	15 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Lower Respiratory Tract irritation Pneumoconiosis Neurotoxicity Not classifiable as a human carcinogen varies		
		PEL	5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Protective gloves against thermal risks

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|--|--|
| a) Appearance | Form: powder
Colour: silver |
| b) Odour | odourless |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 660 °C (1,220 °F) |
| f) Initial boiling point and boiling range | 2,467 °C (4,473 °F) |

- | | |
|---|--|
| g) Flash point | Not applicable |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | May form combustible dust concentrations in air. |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | 2.7 g/mL at 25 °C (77 °F) |
| n) Water solubility | insoluble |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition temperature | not auto-flammable |
| q) Decomposition temperature | Not applicable |
| r) Viscosity | No data available |
| s) Explosive properties | Risk of dust explosion. |
| t) Oxidizing properties | No data available |

9.2 Other safety 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

Risk of dust explosion. Reacts with water to generate Hydrogen gas. Reacts with the following substances: Acids, Bases, Oxidizing agents, Halogens

10.4 Conditions to avoid

Humid air water

Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials

Acids, Bases, Halogens, Oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Aluminum oxide

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - > 2,000 mg/kg

LC50 Inhalation - Rat - 4 h - > 888 mg/l

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

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

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: BD0330000

Cough, weight loss, anemia, Weakness, Incoordination.

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

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

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1309 Class: 4.1 Packing group: II
Proper shipping name: Aluminum powder, coated
Reportable Quantity (RQ):

Poison Inhalation Hazard: No

IMDG

UN number: 1309 Class: 4.1 Packing group: II EMS-No: F-G, S-G
Proper shipping name: ALUMINIUM POWDER, COATED

IATA

UN number: 1309 Class: 4.1 Packing group: II
Proper shipping name: Aluminium powder, coated

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Aluminium powder (non pyrophoric)	7429-90-5	1994-04-01

SARA 311/312 Hazards

Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Aluminium powder (non pyrophoric)	7429-90-5	1994-04-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Aluminium powder (non pyrophoric)	7429-90-5	1994-04-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Aluminium powder (non pyrophoric)	7429-90-5	1994-04-01

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Flam. Sol. Flammable solids
H228 Flammable solid.

HMIS Rating

Health hazard: 0
Chronic Health Hazard:
Flammability: 3
Physical Hazard 3

NFPA Rating

Health hazard: 0

Fire Hazard: 3
Reactivity Hazard: 3

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.9

Revision Date: 05/27/2016

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 06/19/2019
Print Date 06/29/2019**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Anthracene

Product Number : A89200
Brand : Aldrich
CAS-No. : 120-12-7**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 sheetCompany : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATESTelephone : +1 314 771-5765
Fax : +1 800 325-5052**1.4 Emergency telephone number**

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**Carcinogenicity (Category 1A), H350
Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Photosensitizer., Lachrymator.

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	C ₁₄ H ₁₀
Molecular weight	:	178.23 g/mol
CAS-No.	:	120-12-7
EC-No.	:	204-371-1

Component	Classification	Concentration
Anthracene		
	Carc. 1A; Aquatic Acute 1; Aquatic Chronic 1; H350, H400, H410 M-Factor - Aquatic Acute: 1,000	<= 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

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures**6.1 Personal precautions, protective equipment and emergency procedures**

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage**7.1 Precautions for safe handling**

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection**8.1 Control parameters****Components with workplace control parameters**

Component	CAS-No.	Value	Control parameters	Basis
Anthracene	120-12-7	TWA	0.2 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	1910.1002 As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard OSHA specifically regulated carcinogen		
		TWA	0.1 mg/m ³	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products. cyclohexane-extractable fraction See Appendix C See Appendix A		
		PEL	0.2 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Coal tar pitch volatiles (benzene or cyclohexane-soluble fraction) include fused polycyclic hydrocarbons (some of which are known carcinogens) which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard.		
		PEL	0.2 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Coal tar pitch volatiles (benzene or cyclohexane-soluble fraction) include fused polycyclic hydrocarbons (some of which are known carcinogens) which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar		

pitch volatiles' standard.

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Anthracene	120-12-7	1-Hydroxypyrene	2.5 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		3-hydroxybenzo(a)pyrene		Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Chloroprene

Minimum layer thickness: 0.6 mm

Break through time: 480 min

Material tested: Camapren® (KCL 722 / Aldrich Z677493, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 30 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective

equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: crystalline Colour: beige
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 210 - 215 °C (410 - 419 °F) - lit.
f) Initial boiling point and boiling range	340 °C 644 °F - lit.
g) Flash point	121.0 °C (249.8 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	Lower explosion limit: 0.6 %(V)
k) Vapour pressure	1.3 hPa at 145.0 °C (293.0 °F)
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 4.65 at ca.20 °C (ca.68 °F)
p) Auto-ignition temperature	540.0 °C (1004.0 °F)
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety information

No data available

SECTION 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, Hypochlorites

10.6 Hazardous decomposition products

Other decomposition products - No data available

Hazardous decomposition products formed under fire conditions. - Carbon oxides

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - 430 mg/kg

Skin corrosion/irritation

Serious eye damage/eye irritation

Respiratory or skin sensitisation

Causes photosensitivity. Exposure to light can result in allergic reactions resulting in dermatologic lesions, which can vary from sunburnlike responses to edematous, vesiculated lesions, or bullae

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: CA9350000

Possible tumor promoter., Headache, Nausea, Weakness

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

Blood -

SECTION 12: Ecological information**12.1 Toxicity**

Toxicity to fish LC50 - Lepomis macrochirus (Bluegill) - 0.001 mg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 0.10 mg/l - 48 h

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Indication of bioaccumulation.

Bioaccumulation Pimephales promelas (fathead minnow) - 42 d
- 0.01191 mg/l(Anthracene)

Bioconcentration factor (BCF): 649

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

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

Very toxic to aquatic life with long lasting effects.

SECTION 13: Disposal considerations**13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Anthracene)
Reportable Quantity (RQ): 5000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
(Anthracene)
Marine pollutant : yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Anthracene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

SECTION 15: Regulatory information

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Anthracene	120-12-7	2007-07-01

SARA 311/312 Hazards

No SARA Hazards

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Anthracene	120-12-7	2007-07-01

SECTION 16: Other information

Further information

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

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Version: 6.0

Revision Date: 06/19/2019

Print Date: 06/29/2019

SAFETY DATA SHEET

Version 6.2
Revision Date 03/12/2019
Print Date 06/28/2019**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Antimony

Product Number : 266329
Brand : Aldrich
CAS-No. : 7440-36-0**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 sheetCompany : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATESTelephone : +1 314 771-5765
Fax : +1 800 325-5052**1.4 Emergency telephone number**

Emergency Phone # : +1-703-527-3887

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 3), H301

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H301 : Toxic if swallowed.

H335 : May cause respiratory irritation.

Precautionary statement(s)

P261 : Avoid breathing dust/ fume/ gas/ mist/ vapours/ 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.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. 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.
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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	Sb
Molecular weight	:	121.76 g/mol
CAS-No.	:	7440-36-0
EC-No.	:	231-146-5

Component	Classification	Concentration
Antimony		
	Acute Tox. 3; STOT SE 3; H301, H335	<= 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

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Antimony oxide

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods 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.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Air sensitive. Moisture sensitive. Handle and store under inert gas. Keep in a dry place.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials 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

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Antimony	7440-36-0	TWA	0.5 mg/m ³	USA. NIOSH Recommended Exposure Limits
		TWA	0.5 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.5 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation Skin irritation		
		PEL	0.5 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: powder |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 630 °C (1166 °F) - lit. |
| f) Initial boiling point and boiling range | 1,635 °C 2,975 °F - lit. |
| g) Flash point | ()Not applicable |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | 6.69 g/cm ³ at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | Not applicable for inorganic substances |

- | | | |
|----|---------------------------|-------------------|
| p) | Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Antimony oxide

Other decomposition products - No data available

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 100 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

- IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
- NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
- OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

May cause respiratory irritation.

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: CC4025000

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

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish LC50 - Cyprinodon variegatus (sheepshead minnow) - 6.2 - 8.3 mg/l
- 96.0 h
Remarks: No data available

12.2 Persistence and degradability

Biodegradability Result: - According to the results of tests of biodegradability this product is not readily biodegradable.
Remarks: The methods for determining biodegradability are not applicable to inorganic substances.

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

SECTION 13: Disposal considerations**13.1 Waste treatment methods****Product**

Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information**DOT (US)**

UN number: 2871 Class: 6.1 Packing group: III
Proper shipping name: Antimony powder
Reportable Quantity (RQ): 5000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 2871 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: ANTIMONY POWDER
Marine pollutant : yes

IATA

UN number: 2871 Class: 6.1 Packing group: III
Proper shipping name: Antimony powder

SECTION 15: Regulatory information**SARA 302 Components**

This material does not contain any components with a section 302 EHS TPO.

SARA 313 Components

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

	CAS-No.	Revision Date
Antimony	7440-36-0	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Antimony	7440-36-0	2007-07-01

	CAS-No.	Revision Date
Antimony	7440-36-0	2007-07-01

New Jersey Right To Know Components

Antimony

CAS-No.
7440-36-0

Revision Date
2007-07-01

California Prop. 65 Components

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

SECTION 16: Other information

Further information

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

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Version: 6.2

Revision Date: 03/12/2019

Print Date: 06/28/2019

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

Version 6.0 Revision Date 31.03.2016

Print Date 17.07.2019

GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Aroclor 1248 solution

Product Number : 44807

Brand : Supelco

REACH No. : A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008

Flammable liquids (Category 2), H225

Skin irritation (Category 2), H315

Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

Specific target organ toxicity - repeated exposure (Category 2), H373

Aspiration hazard (Category 1), H304

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 Label elements

Labelling according Regulation (EC) No 1272/2008

Pictogram



Signal word : Danger

Hazard statement(s)

H225

Highly flammable liquid and vapour.

H304

May be fatal if swallowed and enters airways.

H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H373	May cause damage to organs through prolonged or repeated exposure.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P273	Avoid release to the environment.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P331	Do NOT induce vomiting.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P501	Dispose of contents/ container to an approved waste disposal plant.
Supplemental Hazard Statements	none

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Molecular weight : 114.23 g/mol

Hazardous ingredients according to Regulation (EC) No 1272/2008

Component	Classification	Concentration
2,2,4-Trimethylpentane		
CAS-No. 540-84-1 EC-No. 208-759-1 Index-No. 601-009-00-8	Flam. Liq. 2; Skin Irrit. 2; STOT SE 3; Asp. Tox. 1; Aquatic Acute 1; Aquatic Chronic 1; H225, H315, H336, H304, H400, H410 M-Factor - Aquatic Acute: 10	>= 90 - <= 100 %
Aroclor 1248		
CAS-No. 12672-29-6 Index-No. 602-039-00-4	STOT RE 2; Aquatic Acute 1; Aquatic Chronic 1; H373, H400, H410 Concentration limits: >= 0.005 %: STOT RE 2, H373; >= 0.005 %: STOT RE 2, H373; M-Factor - Aquatic Acute: 10	>= 0.1 - < 0.25 %

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

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

SECTION 6: Accidental release measures**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas. For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage**7.1 Precautions for safe handling**

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

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

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Storage class (TRGS 510): Flammable liquids

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

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (US) or type ABEK (EN 14387) respirator cartridges as a backup to enginee protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: liquid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -107 °C |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 6 %(V)
Lower explosion limit: 1 %(V) |
| k) Vapour pressure | 88 mmHg at 37.8 °C |

l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	396 °C
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

Solubility in other solvents	Ether - soluble
------------------------------	-----------------

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

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

SECTION 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

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects

Very toxic to aquatic life with long lasting effects.

SECTION 13: Disposal considerations**13.1 Waste treatment methods****Product**

Burn in a chemical incinerator equipped with an afterburner and scrubber b highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information**14.1 UN number**

ADR/RID: 1262

IMDG: 1262

IATA: 1262

14.2 UN proper shipping name

ADR/RID: OCTANES,SOLUTION

IMDG: OCTANES,SOLUTION

IATA: Octanes,SOLUTION

14.3 Transport hazard class(es)

ADR/RID: 3

IMDG: 3

IATA: 3

14.4 Packaging group

ADR/RID: II

IMDG: II

IATA: II

14.5 Environmental hazards

ADR/RID: yesyes

IMDG Marine pollutant: yes

IATA: no

14.6 Special precautions for user

No data available

SECTION 15: Regulatory information**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.2 Chemical safety assessment

For this product a chemical safety assessment was not carried out

SECTION 16: Other information**Full text of H-Statements referred to under sections 2 and 3.**

H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H373	May cause damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Further information

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

SAFETY DATA SHEET

Version 5.3
Revision Date 05/24/2016
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Aroclor 1254

Product Number : 48586
Brand : Supelco
Index-No. : 602-039-00-4

CAS-No. : 11097-69-1

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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
Specific target organ toxicity - repeated exposure (Category 2), H373
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H302

Harmful if swallowed.

H373

May cause damage to organs through prolonged or repeated exposure.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P260

Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.

P264

Wash skin thoroughly after handling.

P270

Do not eat, drink or smoke when using this product.

P273

Avoid release to the environment.

P301 + P312 + P330

IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.

P314	Rinse mouth.
P391	Get medical advice/ attention if you feel unwell.
P501	Collect spillage. Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

CAS-No. : 11097-69-1
 Index-No. : 602-039-00-4

Hazardous components

Component	Classification	Concentration
Aroclor 1254		
	Acute Tox. 4; STOT RE 2; Aquatic Acute 1; Aquatic Chronic 1; H302, H373, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

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

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Storage class (TRGS 510): Non Combustible Liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Aroclor 1254	11097-69-1	TWA	0.5 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Skin designation		
		TWA	0.500000 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.5 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Liver damage Chloracne Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.500000 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Liver damage Chloracne Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		

		TWA	0.5 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		
		TWA	0.001000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		PEL	0.5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Body Protection

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

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|-------------------|
| a) Appearance | Form: liquid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | No data available |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |

- | | | |
|----|--|-------------------|
| k) | Vapour pressure | No data available |
| l) | Vapour density | No data available |
| m) | Relative density | No data available |
| n) | Water solubility | No data available |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 1,010 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Rat

Liver

Unscheduled DNA synthesis

Rat

Liver

DNA damage

Mouse

fibroblast

Morphological transformation.

Rat

Morphological transformation.

Rat

DNA damage

Rat

DNA damage

Carcinogenicity

Carcinogenicity - Rat - Oral

Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Gastrointestinal: Tumors.

Carcinogenicity - Rat - Oral

Tumorigenic: Carcinogenic by RTECS criteria. Liver: Tumors.

Carcinogenicity - Mouse - Skin

Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Skin and Appendages: Other: Tumors.

Tumorigenic: Tumors at site or application.

Carcinogenicity - Rat - Oral

Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Gastrointestinal: Tumors.

Carcinogenicity - Mouse - Oral

Tumorigenic: Neoplastic by RTECS criteria. Liver: Tumors.

Carcinogenicity - Mouse - Intraperitoneal

Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Tumorigenic Effects: Uterine tumors. Lungs, Thorax, or Respiration: Tumors.

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

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

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

Reproductive toxicity

No data available

Reproductive toxicity - Rabbit - Oral

Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Effects on Fertility: Abortion. Effects on Embryo or Fetus: Fetal death.

Reproductive toxicity - Rabbit - Oral

Effects on Newborn: Biochemical and metabolic.

Reproductive toxicity - Rat - Oral

Effects on Newborn: Biochemical and metabolic.

Reproductive toxicity - Rat - Oral

Effects on Newborn: Behavioral.

Reproductive toxicity - Rat - Oral
Effects on Newborn: Delayed effects.

Reproductive toxicity - Rat - Intraperitoneal
Maternal Effects: Other effects. Effects on Newborn: Biochemical and metabolic.

Reproductive toxicity - Mouse - Oral
Effects on Newborn: Behavioral.

Reproductive toxicity - Mammal - Oral
Effects on Fertility: Female fertility index (e.g., # females pregnant per # sperm positive females; # females pregnant per # females mated).

No data available

Developmental Toxicity - Rat - Oral
Specific Developmental Abnormalities: Hepatobiliary system.

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

May cause damage to organs through prolonged or repeated exposure.

Aspiration hazard

No data available

Additional Information

RTECS: Not available

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

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - *Oncorhynchus mykiss* (rainbow trout) - 0.22 µg/l - 96.0 h

Toxicity to algae LC50 - Algae - 0.015 mg/l - 28 h

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation *Pimephales promelas* (fathead minnow) - 8 Months
- 1.8 µg/l

Bioconcentration factor (BCF): 238,000

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

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

UN number: 2315 Class: 9 Packing group: II
 Proper shipping name: Polychlorinated biphenyls, liquid
 Reportable Quantity (RQ): 1 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 2315 Class: 9 Packing group: II EMS-No: F-A, S-A
 Proper shipping name: POLYCHLORINATED BIPHENYLS, LIQUID
 Marine pollutant: yes

IATA

UN number: 2315 Class: 9 Packing group: II
 Proper shipping name: Polychlorinated biphenyls, liquid

15. REGULATORY INFORMATION**SARA 302 Components**

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

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.

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Aroclor 1254	11097-69-1	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Aroclor 1254	11097-69-1	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Aroclor 1254	11097-69-1	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Aroclor 1254	11097-69-1	1990-06-30

	CAS-No.	Revision Date
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Aroclor 1254	11097-69-1	1990-06-30

16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H302	Harmful if swallowed.
H373	May cause damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.

H410 Very toxic to aquatic life with long lasting effects.
STOT RE Specific target organ toxicity - repeated exposure

HMIS Rating

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

NFPA Rating

Health hazard: 1
Fire Hazard: 0
Reactivity Hazard: 0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.3

Revision Date: 05/24/2016

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 06/17/2019
Print Date 07/17/2019

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : AROCLOR 1260
Product Number : CRM48736
Brand : Supelco

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 Street
ST. LOUIS MO 63103
UNITED STATES
Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Carcinogenicity (Category 1B), H350

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)
H350 : May cause cancer.

Precautionary statement(s)
P201 : Obtain special instructions before use.
P202 : Do not handle until all safety precautions have been read and understood.
P280 : Wear protective gloves/ protective clothing/ eye protection/ face protection.
P308 + P313 : IF exposed or concerned: Get medical advice/ attention.

P405
P501

Store locked up.
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

3.2 Mixtures

Component		Classification	Concentration
Distillates (petroleum), hydrotreated middle			
CAS-No.	64742-46-7	Carc. 1B; H350	>= 90 - <= 100 %
EC-No.	265-148-2		
Index-No.	649-221-00-X		
Baseoil - unspecified			
CAS-No.	64742-53-6	Carc. 1B; H350	>= 30 - < 50 %
EC-No.	265-156-6		
Index-No.	649-466-00-2		
2,6-di-tert-Butyl-p-cresol			
CAS-No.	128-37-0	Aquatic Chronic 1; H410 M-Factor - Aquatic Acute: 1 M-Factor - Aquatic Chronic: 1	>= 0.1 - < 1 %
EC-No.	204-881-4		
Registration number	01-2119565113-46-XXXX		

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

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Nature of decomposition products not known.

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Store at room temperature.

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

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Distillates (petroleum), hydrotreated middle	64742-46-7	TWA	500.000000 ppm 2,000.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	The value in mg/m3 is approximate.		
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		As sampled by method that does not collect vapor.		
Baseoil - unspecified	64742-53-6	TWA	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Not classifiable as a human carcinogen		

		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		As sampled by method that does not collect vapor.		
2,6-di-tert-Butyl-p-cresol	128-37-0	TWA	2 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Not classifiable as a human carcinogen		
		TWA	10 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	10 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Body Protection

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

Respiratory protection

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

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: liquid
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	No data available
f) Initial boiling point and boiling range	No data available
g) Flash point	()No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

Other decomposition products - No data available

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

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

SECTION 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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

SECTION 15: Regulatory information

SARA 302 Components

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

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

Chronic Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Distillates (petroleum), hydrotreated middle	CAS-No. 64742-46-7	Revision Date 1989-08-11
Baseoil - unspecified	64742-53-6	2016-09-09

SECTION 16: Other information

Further information

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

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Version: 6.0

Revision Date: 06/17/2019

Print Date: 07/17/2019

SAFETY DATA SHEET

Version 4.13
Revision Date 09/12/2018
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Arsenic

Product Number : 202657
Brand : Aldrich
Index-No. : 033-001-00-X

CAS-No. : 7440-38-2

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H331
Carcinogenicity (Category 1B), H350
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H302 Harmful if swallowed.
H331 Toxic if inhaled.
H350 May cause cancer.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.

P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	As
Molecular weight	:	74.92 g/mol
CAS-No.	:	7440-38-2
EC-No.	:	231-148-6
Index-No.	:	033-001-00-X

Hazardous components

Component	Classification	Concentration
Arsenic	Acute Tox. 4; Acute Tox. 3; Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H302, H331, H350, H410	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

Storage class (TRGS 510): 6.1B: Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Arsenic	7440-38-2	TWA	0.01 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Lung cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen		

		C	0.0020 mg/m ³	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A 15 minute ceiling value		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
	-	inorganic arsenic plus methylated metabolites	35µg As/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of the workweek (After four or five consecutive working days with exposure)			

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance	Form: powder Colour: light grey, black
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 817 °C (1,503 °F) - lit.
f) Initial boiling point and boiling range	613 °C (1,135 °F) - lit.
g) Flash point	Not applicable
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	5.727 g/mL at 25 °C (77 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

Heat Exposure to air may affect product quality.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Arsenic oxides
Other decomposition products - No data available

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 763 mg/kg

Remarks: Behavioral:Ataxia. Diarrhoea

LD50 Oral - Mouse - 145 mg/kg

Remarks: Behavioral:Ataxia. Diarrhoea

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Carcinogenicity

No data available

IARC: 1 - Group 1: Carcinogenic to humans (Arsenic)

NTP: Known - Known to be human carcinogen (Arsenic)

OSHA: OSHA specifically regulated carcinogen (Arsenic)

Reproductive toxicity

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: CG0525000

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

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - Pimephales promelas (fathead minnow) - 9.9 mg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 3.8 mg/l - 48 h

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1558 Class: 6.1 Packing group: II
Proper shipping name: Arsenic
Reportable Quantity (RQ): 1 lbs Reportable Quantity (RQ): 1 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1558 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: ARSENIC
Marine pollutant: yes

IATA

UN number: 1558 Class: 6.1 Packing group: II
Proper shipping name: Arsenic

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Arsenic	7440-38-2	2015-11-23

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Reportable Quantity D004 lbs

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Arsenic	7440-38-2	2015-11-23

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Arsenic	7440-38-2	2015-11-23

	CAS-No.	Revision Date
Arsenic	7440-38-2	2015-11-23

New Jersey Right To Know Components

Arsenic

CAS-No.
7440-38-2

Revision Date
2015-11-23

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.
Arsenic

CAS-No.
7440-38-2

Revision Date
2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H302	Harmful if swallowed.
H331	Toxic if inhaled.
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.13

Revision Date: 09/12/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 05/28/2017
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Barium

Product Number : 474711

Brand : Aldrich

CAS-No. : 7440-39-3

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Substances and mixtures, which in contact with water, emit flammable gases (Category 2), H261

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H261

In contact with water releases flammable gases.

Precautionary statement(s)

P223

Do not allow contact with water.

P231 + P232

Handle under inert gas. Protect from moisture.

P280

Wear protective gloves/ eye protection/ face protection.

P335 + P334

Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.

P370 + P378

In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

P402 + P404
P501

Store in a dry place. Store in a closed container.
Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula : Ba
Molecular weight : 137.33 g/mol
CAS-No. : 7440-39-3
EC-No. : 231-149-1

Hazardous components

Component	Classification	Concentration
Barium		
	Water-react. 2; H261	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Dry powder

5.2 Special hazards arising from the substance or mixture

Barium oxide

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combu formation should be taken into consideration before additional processing

Provide appropriate exhaust ventilation at places where dust is formed.Keep away from sources of ignition - No smoking.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Never allow product to get in contact with water during storage.

Store under inert gas.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Barium	7440-39-3	TWA	0.500000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Eye, skin, & Gastrointestinal irritation Muscular stimulation Not classifiable as a human carcinogen		
		TWA	0.500000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.500000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Eye irritation Muscular stimulation Skin irritation Gastrointestinal irritation Not classifiable as a human carcinogen		
		TWA	0.500000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Eye irritation Muscular stimulation Skin irritation Gastrointestinal irritation Not classifiable as a human carcinogen		

		TWA	0.5 mg/m ³	USA. NIOSH Recommended Exposure Limits
--	--	-----	-----------------------	--

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (EN 143) respirator cartridges as a backup to engineering controls. If th full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|--|--|
| a) Appearance | Form: Pieces
Colour: grey |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 725 °C (1337 °F) - lit. |
| f) Initial boiling point and boiling range | 1,640 °C (2,984 °F) - lit. |
| g) Flash point | ()Not applicable |
| h) Evaporation rate | No data available |

- | | |
|---|--|
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | 3.6 g/cm ³ at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition 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

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

Reacts violently with water.

10.4 Conditions to avoid

Exposure to moisture

10.5 Incompatible materials

Oxidizing agents, Water, acids, Oxygen, Chlorinated solvents, Carbon dioxide (CO₂), Halogens, Halogenated hydrocarbon, Alcohols, Sulphur compounds, Hydrogen sulfide gas

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Barium oxide

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available Barium

Inhalation: No data available (Barium)

Dermal: No data available (Barium)

No data available (Barium)

Skin corrosion/irritation

No data available (Barium)

Serious eye damage/eye irritation

No data available (Barium)

Respiratory or skin sensitisation

No data available(Barium)

Germ cell mutagenicity

No data available(Barium)

Carcinogenicity

This product is or contains a component that is not classifiable as to its classification.(Barium)

(Barium)

(Barium)

Reproductive toxicity

No data available(Barium)

No data available(Barium)

Specific target organ toxicity - single exposure

No data available(Barium)

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available(Barium)

Additional Information

RTECS: CQ8370000

Stomach/intestinal disorders, Nausea, Vomiting, Drowsiness, Dizziness, Gastrointestinal disturbance, Weakness, Tremors, Seizures.(Barium)

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

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish mortality NOEC - Cyprinodon variegatus (sheepshead minnow) - 500 mg/l - 96 h(Barium)

LC50 - Cyprinodon variegatus (sheepshead minnow) - > 500 mg/l - 96 h(Barium)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(Barium)

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

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1400 Class: 4.3 Packing group: II
Proper shipping name: Barium
Reportable Quantity (RQ) : 1000 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1400 Class: 4.3 Packing group: II EMS-No: F-G, S-O
Proper shipping name: BARIUM

IATA

UN number: 1400 Class: 4.3 Packing group: II
Proper shipping name: Barium

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Barium	7440-39-3	2007-07-01

SARA 311/312 Hazards

Reactivity Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	2007-07-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H261 In contact with water releases flammable gases.

HMIS Rating

Health hazard: 0
Chronic Health Hazard:
Flammability: 3
Physical Hazard 1

NFPA Rating

Health hazard: 0
Fire Hazard: 3
Reactivity Hazard: 1
Special hazard.I: W

Further information

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

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 6.1

Revision Date: 05/28/2017

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 05/28/2017
Print Date 06/29/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Benzaldehyde

Product Number : B1334
Brand : Sigma-Aldrich
Index-No. : 605-012-00-5

CAS-No. : 100-52-7

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 4), H227
Acute toxicity, Oral (Category 4), H302
Acute toxicity, Dermal (Category 4), H312
Skin irritation (Category 2), H315
Acute aquatic toxicity (Category 2), H401

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

Warning

Hazard statement(s)

H227 Combustible liquid.
H302 + H312 Harmful if swallowed or in contact with skin
H315 Causes skin irritation.
H401 Toxic to aquatic life.

Precautionary statement(s)	
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of water.Call a POISON CENTER/doctor if you feel unwell.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: Artificial essential oil of almond
Formula	: C<SB>7</SB>H<SB>6</SB>O
Molecular weight	: 106.12 g/mol
CAS-No.	: 100-52-7
EC-No.	: 202-860-4
Index-No.	: 605-012-00-5

Hazardous components

Component	Classification	Concentration
Benzaldehyde		
	Flam. Liq. 4; Acute Tox. 4; Skin Irrit. 2; Aquatic Acute 2; H227, H302 + H312, H315, H401	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Under fire conditions, material may decompose to form flammable and/or explosive mixtures in air. Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

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

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

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

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

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Store under nitrogen. Keep container tightly closed in a dry and well-ventilated place.

Air, light, and moisture sensitive.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Benzaldehyde	100-52-7	TWA	2.000000 ppm	USA. Workplace Environmental Exposure Levels (WEEL)
	Remarks	Dermal Sensitization Notation		
		STEL	4.000000 ppm	USA. Workplace Environmental Exposure Levels (WEEL)
		Dermal Sensitization Notation		

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 480 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact

Material: Chloroprene

Minimum layer thickness: 0.6 mm

Break through time: 35 min

Material tested: Camapren® (KCL 722 / Aldrich Z677493, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (US) or type ABEK (EN 14387) respirator cartridges as a backup to enginee protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|--|---|
| a) Appearance | Form: liquid
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | 5.9 at 20 °C (68 °F) |
| e) Melting point/freezing point | Melting point/range: -26 °C (-15 °F) - lit. |
| f) Initial boiling point and boiling range | 178 - 179 °C (352 - 354 °F) - lit. |
| g) Flash point | 64 °C (147 °F) - closed cup |
| h) Evaporation rate | No data available |

- | | |
|---|--|
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 8.5 %(V)
Lower explosion limit: 1.4 %(V) |
| k) Vapour pressure | 5 hPa at 45 °C (113 °F) |
| l) Vapour density | 3.66 - (Air = 1.0) |
| m) Relative density | 1.044 g/cm ³ at 20 °C (68 °F) |
| n) Water solubility | slightly soluble |
| o) Partition coefficient: n-octanol/water | log Pow: 1.5 |
| p) Auto-ignition 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

Relative vapour density 3.66 - (Air = 1.0)

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

Air Exposure to moisture Light. Heat
Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents, Strong reducing agents, Strong bases, Alkali metals, Aluminium, Iron, phenols, Oxygen

10.6 Hazardous decomposition products

Other decomposition products - No data available

Hazardous decomposition products formed under fire conditions. - Carbon oxides

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 1,300 mg/kg(Benzaldehyde)

Remarks: Behavioral:Somnolence (general depressed activity). Behavioral:Coma.

Inhalation: No data available(Benzaldehyde)

LD50 Dermal - Rabbit - 1,250 mg/kg(Benzaldehyde)

No data available(Benzaldehyde)

Skin corrosion/irritation

Skin - Rabbit(Benzaldehyde)

Result: Skin irritation - 24 h

Serious eye damage/eye irritation

Eyes - Rabbit(Benzaldehyde)

Result: Mild eye irritation

Respiratory or skin sensitisation**Germ cell mutagenicity**

Laboratory experiments have shown mutagenic effects.(Benzaldehyde)

Carcinogenicity

This product is or contains a component that is not classifiable as to its classification.(Benzaldehyde)

(Benzaldehyde)

(Benzaldehyde)

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

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

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

Reproductive toxicity

No data available(Benzaldehyde)

No data available(Benzaldehyde)

Specific target organ toxicity - single exposure

No data available(Benzaldehyde)

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available(Benzaldehyde)

Additional Information

RTECS: CU4375000

Central nervous system depression, Prolonged or repeated exposure to skin causes defatting and dermatitis.(Benzaldehyde)

Liver - Irregularities - Based on Human Evidence

Liver - Irregularities - Based on Human Evidence(Benzaldehyde)

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish	LC50 - Lepomis macrochirus - 1.07 mg/l - 96 h(Benzaldehyde)
	mortality LOEC - Pimephales promelas (fathead minnow) - 0.45 mg/l - 7 d(Benzaldehyde)
	mortality NOEC - Pimephales promelas (fathead minnow) - 0.22 mg/l - 7 d(Benzaldehyde)
	LC50 - Leuciscus idus (Golden orfe) - 62 mg/l - 48 h(Benzaldehyde)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 50 mg/l - 24 h(Benzaldehyde)

12.2 Persistence and degradability

Biodegradability Biotic/Aerobic - Exposure time 28 d(Benzaldehyde)

Result: 95 % - Readily biodegradable.

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(Benzaldehyde)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

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

Toxic to aquatic life.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1990 Class: 9 Packing group: III

Proper shipping name: Benzaldehyde

Poison Inhalation Hazard: No

IMDG

UN number: 1990 Class: 9 Packing group: III EMS-No: F-A, S-A

Proper shipping name: BENZALDEHYDE

IATA

UN number: 1990 Class: 9 Packing group: III

Proper shipping name: Benzaldehyde

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

Benzaldehyde	CAS-No. 100-52-7	Revision Date 2007-03-01
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Pennsylvania Right To Know Components

Benzaldehyde	CAS-No. 100-52-7	Revision Date 2007-03-01
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New Jersey Right To Know Components

Benzaldehyde

CAS-No.
100-52-7

Revision Date
2007-03-01

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H227	Combustible liquid.
H302	Harmful if swallowed.
H302 + H312	Harmful if swallowed or in contact with skin
H312	Harmful in contact with skin.
H315	Causes skin irritation.
H401	Toxic to aquatic life.

HMIS Rating

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

NFPA Rating

Health hazard:	2
Fire Hazard:	2
Reactivity Hazard:	0
Health hazard:	2
Fire Hazard:	2
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 05/28/2017

Print Date: 06/29/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 01/31/2017
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Benzene

Product Number : 270709
Brand : SIGALD
Index-No. : 601-020-00-8

CAS-No. : 71-43-2

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Germ cell mutagenicity (Category 1B), H340
Carcinogenicity (Category 1A), H350
Specific target organ toxicity - repeated exposure (Category 1), H372
Aspiration hazard (Category 1), H304
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H225

Highly flammable liquid and vapour.

H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H340	May cause genetic defects.
H350	May cause cancer.
H372	Causes damage to organs through prolonged or repeated exposure.
H412	Harmful to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
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.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₆ H ₆
Molecular weight	: 78.11 g/mol
CAS-No.	: 71-43-2
EC-No.	: 200-753-7
Index-No.	: 601-020-00-8

Hazardous components

Component	Classification	Concentration
Benzene	Flam. Liq. 2; Skin Irrit. 2; Eye Irrit. 2A; Muta. 1B; Carc. 1A; STOT RE 1; Asp. Tox. 1; Aquatic Acute 3; Aquatic Chronic 3; H225, H304, H315, H319, H340, H350, H372,	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

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

If swallowed

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

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

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

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

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

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

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Benzene	71-43-2	TWA	0.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Leukemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen Danger of cutaneous absorption		
		STEL	2.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Leukemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen Danger of cutaneous absorption		
		TWA	10 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.40-1969		
		CEIL	25 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.40-1969		
		Peak	50 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.40-1969		
		See 1910.1028. See Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028 The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply.		
		TWA	0.1 ppm	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		ST	1 ppm	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
-----------	---------	------------	-------	---------------------	-------

Benzene	71-43-2	S-Phenylmercapturic acid	0.0300 mg/g	In urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			
		t,t-Muconic acid	0.5000 mg/g	In urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

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

Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

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

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

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

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (US) or type ABEK (EN 14387) respirator cartridges as a backup to enginee protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance

Form: liquid

Colour: colourless

b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	5.5 °C (41.9 °F)
f) Initial boiling point and boiling range	80.0 - 80.2 °C (176.0 - 176.4 °F)
g) Flash point	-11.0 °C (12.2 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	Upper explosion limit: 8 %(V) Lower explosion limit: 1.3 %(V)
k) Vapour pressure	221.3 hPa at 37.7 °C (99.9 °F) 99.5 hPa at 20.0 °C(68.0 °F)
l) Vapour density	No data available
m) Relative density	0.88 g/cm ³
n) Water solubility	ca.1.88 g/l at 23.5 °C (74.3 °F) - soluble
o) Partition coefficient: n-octanol/water	log Pow: 2.13 at 25 °C (77 °F)
p) Auto-ignition temperature	562.0 °C (1043.6 °F)
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety information

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

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

acids, Bases, Halogens, Strong oxidizing agents, Metallic salts

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male - > 5,960 mg/kg(Benzene)
(OECD Test Guideline 401)
LC50 Inhalation - Rat - female - 4 h - 43.7 mg/l(Benzene)
(OECD Test Guideline 403)
LD50 Dermal - Rabbit - 8,263 mg/kg(Benzene)
No data available(Benzene)

Skin corrosion/irritation

Skin - Rabbit(Benzene)
Result: Skin irritation - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit(Benzene)
Result: Eye irritation

Respiratory or skin sensitisation

Maximisation Test - Guinea pig(Benzene)
Result: Does not cause skin sensitisation.

Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.(Benzene)
In vivo tests showed mutagenic effects(Benzene)
Chinese hamster lung cells
Result: positive
OECD Test Guideline 475(Benzene)
Mouse - male
Result: positive

Carcinogenicity

This is or contains a component that has been reported to be carcinogenic classification.(Benzene)
Human carcinogen.(Benzene)

IARC: 1 - Group 1: Carcinogenic to humans (Benzene)
NTP: Known to be human carcinogen (Benzene)
OSHA: OSHA specifically regulated carcinogen (Benzene)

Reproductive toxicity

Specific target organ toxicity - single exposure

No data available(Benzene)

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

May be fatal if swallowed and enters airways.(Benzene)

Additional Information

Repeated dose toxicity - Rat - male and female - Oral - No observed adverse effect level - 100 mg/kg(Benzene)
RTECS: CY1400000

Nausea, Dizziness, Headache, narcosis, Inhalation of high concentrations of benzene may have an initial stimulatory exhilaration, nervous excitation and/or giddiness, depression, drowsiness chest, breathlessness, and loss of consciousness. Tremors, convulsions, a collapse can occur in a few minutes to several hours following severe exposure causes pulmonary edema and hemorrhage of pulmonary tissue. Direct skin contact may result in drying, scaling dermatitis, or development of second hematopoietic system. Bleeding from the nose, gums, or mucous membranes a

leukopenia, thrombocytopenia, aplastic anemia, and leukemia may occur as normal, aplastic or hyperplastic, and may not correlate with peripheral benzene exposure may be delayed for many months or years after the actual, Blood disorders(Benzene)

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence(Benzene)

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - Pimephales promelas (fathead minnow) - 15.00 - 32.00 mg/l - 96 h(Benzene)

Toxicity to daphnia and other aquatic invertebrates EC50 - Ceriodaphnia dubia (water flea) - 17.2 mg/l - 48 h(Benzene)

Toxicity to algae Growth inhibition EC50 - Pseudokirchneriella subcapitata (green algae) - 100 mg/l - 72 h(Benzene) (OECD Test Guideline 201)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 d(Benzene)
Result: 96 % - Readily biodegradable.
(OECD Test Guideline 301F)

12.3 Bioaccumulative potential

Bioaccumulation Leuciscus idus (Golden orfe) - 3 d - 0.05 mg/l(Benzene)

Bioconcentration factor (BCF): 10

12.4 Mobility in soil

No data available(Benzene)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Harmful to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1114 Class: 3 Packing group: II
Proper shipping name: Benzene
Reportable Quantity (RQ) : 10 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1114 Class: 3
Proper shipping name: BENZENE

Packing group: II

EMS-No: F-E, S-D

IATA

UN number: 1114 Class: 3
Proper shipping name: Benzene

Packing group: II

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Benzene	71-43-2	2009-02-01

Benzene

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

	CAS-No.	Revision Date
Benzene	71-43-2	2009-02-01

Benzene

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H340	May cause genetic defects.
H350	May cause cancer.
H372	Causes damage to organs through prolonged or repeated exposure.
H402	Harmful to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

HMIS Rating

Health hazard: 2
Chronic Health Hazard: *

Flammability: 3
Physical Hazard 0

NFPA Rating

Health hazard: 2
Fire Hazard: 3
Reactivity Hazard: 0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 01/31/2017

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.1
 Revision Date 07/25/2018
 Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Benz[<I>a</I>]anthracene
 Product Number : B2209
 Brand : Aldrich
 Index-No. : 601-033-00-9
 CAS-No. : 56-55-3

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 Street
 ST. LOUIS MO 63103
 UNITED STATES
 Telephone : +1 314 771-5765
 Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Carcinogenicity (Category 1B), H350

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P273	Avoid release to the environment.
P281	Use personal protective equipment as required.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : 1,2-Benzanthracene
Tetraphene

Formula : C₁₈H₁₂
Molecular weight : 228.29 g/mol
CAS-No. : 56-55-3
EC-No. : 200-280-6
Index-No. : 601-033-00-9

Hazardous components

Component	Classification	Concentration
Benz[a]anthracene	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides

Nature of decomposition products not known.

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: solid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 157 - 159 °C (315 - 318 °F) |
| f) Initial boiling point and boiling range | 437.6 °C (819.7 °F) |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | No data available |

- | | |
|---|-------------------|
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - > 200 mg/kg

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene)
IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene)
NTP: RAHC - Reasonably anticipated to be a human carcinogen (Benz[a]anthracene)
NTP: RAHC - Reasonably anticipated to be a human carcinogen (Benz[a]anthracene)
OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.
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

No data available
No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

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

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(Benz[a]anthracene)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

Not dangerous goods

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benz[a]anthracene)
Marine pollutant : yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benz[a]anthracene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

SARA 311/312 Hazards

Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Benz[a]anthracene	56-55-3	2007-09-28

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Benz[a]anthracene	56-55-3	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H350 May cause cancer.

H400 Very toxic to aquatic life.
H410 Very toxic to aquatic life with long lasting effects.

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 6.1

Revision Date: 07/25/2018

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 07/25/2018
Print Date 06/29/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Benzo[*a*]pyrene

Product Number : B1760
Brand : Sigma
Index-No. : 601-032-00-3

CAS-No. : 50-32-8

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Skin sensitisation (Category 1), H317

Germ cell mutagenicity (Category 1B), H340

Carcinogenicity (Category 1B), H350

Reproductive toxicity (Category 1B), H360

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word	Danger
Hazard statement(s)	
H317	May cause an allergic skin reaction.
H340	May cause genetic defects.
H350	May cause cancer.
H360	May damage fertility or the unborn child.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P272	Contaminated work clothing should not be allowed out of the workplace.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: 3,4-Benzpyrene 3,4-Benzopyrene Benzo[<i>a</i>]chrysene
Formula	: C ₂₀ H ₁₂
Molecular weight	: 252.31 g/mol
CAS-No.	: 50-32-8
EC-No.	: 200-028-5
Index-No.	: 601-032-00-3

Hazardous components

Component	Classification	Concentration
Benzo[<i>a</i>]pyrene	Skin Sens. 1; Muta. 1B; Carc. 1B; Repr. 1B; Aquatic Acute 1; Aquatic Chronic 1; H317, H340, H350, H360, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
	Remarks	<p>Cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section), see BEI® for Polycyclic Aromatic Hydrocarbons (PAHs) Exposure by all routes should be carefully controlled to levels as low as possible. Suspected human carcinogen</p>		
		<p>Cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section), see BEI® for Polycyclic Aromatic Hydrocarbons (PAHs) Exposure by all routes should be carefully controlled to levels as low as possible. Suspected human carcinogen</p>		
Benzo[a]pyrene	50-32-8	TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		<p>1910.1002 As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard OSHA specifically regulated carcinogen</p>		
		TWA	0.100000 mg/m3	USA. NIOSH Recommended Exposure Limits
		<p>Potential Occupational Carcinogen NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products. cyclohexane-extractable fraction See Appendix C See Appendix A</p>		
		TWA	0.2 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		<p>1910.1002 As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard OSHA specifically regulated carcinogen</p>		
		TWA	0.1 mg/m3	USA. NIOSH Recommended Exposure Limits
		<p>Potential Occupational Carcinogen NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products. cyclohexane-extractable fraction</p>		

		See Appendix C See Appendix A		
		TWA	0.2 mg/m ³	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Benzo[a]pyrene	50-32-8	1-Hydroxypyrene		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		1-Hydroxypyrene		Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance	Form: solid
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 177 - 180 °C (351 - 356 °F) - lit.
f) Initial boiling point and boiling range	495 °C (923 °F) - lit.
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	1.35 g/cm ³
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 5.97
p) Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available
Inhalation: No data available
Dermal: No data available
LD50 Subcutaneous - Rat - 50 mg/kg

Skin corrosion/irritation

Skin - Mouse
Result: Mild skin irritation

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

Chronic exposure may cause dermatitis.

Germ cell mutagenicity

May alter genetic material.
In vivo tests showed mutagenic effects

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.
Possible human carcinogen

IARC: 1 - Group 1: Carcinogenic to humans (Benzo[a]pyrene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Benzo[a]pyrene)

OSHA: OSHA specifically regulated carcinogen (Benzo[a]pyrene)

Reproductive toxicity

May cause congenital malformation in the fetus.
Presumed human reproductive toxicant
May cause reproductive disorders.

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: DJ3675000

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 0.25 mg/l - 48 h(Benzo[a]pyrene)

Toxicity to algae EC50 - Pseudokirchneriella subcapitata (green algae) - 0.02 mg/l - 72 h(Benzo[a]pyrene)

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation Lepomis macrochirus (Bluegill) - 48 h
- 0.0005 mg/l(Benzo[a]pyrene)

Bioconcentration factor (BCF): 3,208

12.4 Mobility in soil

No data available(Benzo[a]pyrene)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benzo[a]pyrene)
Reportable Quantity (RQ) : 1 lbs

no

Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benzo[a]pyrene)
Marine pollutant : yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benzo[a]pyrene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Benzo[a]pyrene	50-32-8	2007-03-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

Benzo[a]pyrene

CAS-No.
50-32-8Revision Date
2007-03-01**Pennsylvania Right To Know Components**

Benzo[a]pyrene

CAS-No.
50-32-8Revision Date
2007-03-01

Benzo[a]pyrene

CAS-No.
50-32-8Revision Date
2007-03-01**New Jersey Right To Know Components**

Benzo[a]pyrene

CAS-No.
50-32-8Revision Date
2007-03-01**California Prop. 65 Components**

WARNING! This product contains a chemical known to the State of California to cause cancer.

CAS-No.
50-32-8Revision Date
1990-01-01

Benzo[a]pyrene

16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

H317	May cause an allergic skin reaction.
H340	May cause genetic defects.
H350	May cause cancer.
H360	May damage fertility or the unborn child.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 6.1

Revision Date: 07/25/2018

Print Date: 06/29/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 07/25/2018
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Benzo[**a**]fluoranthene

Product Number : 275336

Brand : Aldrich

Index-No. : 601-034-00-4

CAS-No. : 205-99-2

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Carcinogenicity (Category 1B), H350

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P273	Avoid release to the environment.
P281	Use personal protective equipment as required.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : 3,4-Benzofluoranthene
Benz[e]acephenanthrylene
2,3-Benzfluoranthene
3,4-Benz[e]acephenanthrylene
Benzo[b]fluoranthene
Benzo[e]fluoranthene
NSC 89265

Formula : C₂₀H₁₂
Molecular weight : 252.31 g/mol
CAS-No. : 205-99-2
EC-No. : 205-911-9
Index-No. : 601-034-00-4

Hazardous components

Component	Classification	Concentration
Benz[e]acephenanthrylene		
	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

	Remarks
	Cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section), see BEI® for Polycyclic Aromatic Hydrocarbons (PAHs) Exposure by all routes should be carefully controlled to levels as low as possible. Suspected human carcinogen

Hazardous components without workplace control parameters

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Benz[e]acephenant hrylene	205-99-2	1-Hydroxypyrene		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---------------------------------|---|
| a) Appearance | Form: solid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 163 - 165 °C (325 - 329 °F) - lit. |

f)	Initial boiling point and boiling range	No data available
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

TDLo Oral - Mouse - 7.57 mg/kg

Remarks: Liver:Changes in liver weight. Endocrine:Changes in thymus weight.

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[e]acephenanthrylene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Benz[e]acephenanthrylene)

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

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

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

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to daphnia and other aquatic invertebrates Immobilization EC50 - Daphnia magna (Water flea) - > 1.024 mg/l - 24 h(Benz[e]acephenanthrylene)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(Benz[e]acephenanthrylene)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

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

Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

Not dangerous goods

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F

Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.

(Benz[e]acephenanthrylene)

Marine pollutant : yes

IATA

UN number: 3077 Class: 9 Packing group: III

Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benz[e]acephenanthrylene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

SARA 311/312 Hazards

Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer.	205-99-2	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 6.1

Revision Date: 07/25/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 02/08/2019
Print Date 06/29/2019**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : BENZO(G,H,I)PERYLENE, 98%

Product Number : B9009
Brand : Aldrich
CAS-No. : 191-24-2**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 sheetCompany : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATESTelephone : +1 314 771-5765
Fax : +1 800 325-5052**1.4 Emergency telephone number**

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Warning

Hazard statement(s)
H410 : Very toxic to aquatic life with long lasting effects.Precautionary statement(s)
P273 : Avoid release to the environment.
P391 : Collect spillage.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none**SECTION 3: Composition/information on ingredients****3.1 Substances**

Synonyms : 1,12-Benzoperylene

Formula : C₂₂H₁₂

Molecular weight : 276.33 g/mol

CAS-No. : 191-24-2

EC-No. : 205-883-8

Component	Classification	Concentration
Benzo[ghi]perylene Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)		
	Aquatic Acute 1; Aquatic Chronic 1; H400, H410 M-Factor - Aquatic Acute: 1,000 - Aquatic Chronic: 1,000	<= 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**

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): 13: Non Combustible Solids

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

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Benzo[ghi]perylene	191-24-2	PEL	0.2 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
	Remarks	Coal tar pitch volatiles (benzene or cyclohexane-soluble fraction) include fused polycyclic hydrocarbons (some of which are known carcinogens) which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard.		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Benzo[ghi]perylene	191-24-2	1-Hydroxypyrene	2.5 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		3-hydroxybenzo(a)pyrene		Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: solid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 277 - 279 °C (531 - 534 °F) - lit. |
| f) Initial boiling point and boiling range | > 500 °C > 932 °F - lit. |
| g) Flash point | ()No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | No data available |
| n) Water solubility | insoluble |
| o) Partition coefficient: n-octanol/water | log Pow: 6.22 at 25 °C (77 °F) |

- | | | |
|----|---------------------------|-------------------|
| p) | Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

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

SECTION 12: Ecological information

12.1 Toxicity

No data available

Toxicity to daphnia and other aquatic invertebrates static test EC50 - Daphnia magna (Water flea) - 0.0002 mg/l - 48 h

Toxicity to algae Growth rate EC10 - Pseudokirchneriella subcapitata (green algae) - > 0.0016 mg/l - 72 h

12.2 Persistence and degradability

Biodegradability Result: - Not rapidly biodegradable
Remarks: 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

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

Very toxic to aquatic life with long lasting effects.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

Not dangerous goods

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
(Benzo[ghi]perylene)
Marine pollutant : yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s.
(Benzo[ghi]perylene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

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

	CAS-No.	Revision Date
Benzo[ghi]perylene	191-24-2	2015-11-23

SARA 311/312 Hazards

No SARA Hazards

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benzo[ghi]perylene	191-24-2	2015-11-23

Pennsylvania Right To Know Components

Benzo[ghi]perylene

CAS-No.
191-24-2

Revision Date
2015-11-23

California Prop. 65 Components

, which is/are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov. Benzo[ghi]perylene

CAS-No.
191-24-2

Revision Date
2007-09-28

SECTION 16: Other information

Further information

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

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: 6.0

Revision Date: 02/08/2019

Print Date: 06/29/2019

SAFETY DATA SHEET

Version 3.12
Revision Date 08/20/2018
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Benzo[k]fluoranthene

Product Number : 392251
Brand : Aldrich
Index-No. : 601-036-00-5

CAS-No. : 207-08-9

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Carcinogenicity (Category 1B), H350
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P273

Avoid release to the environment.

P281

Use personal protective equipment as required.

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P391

Collect spillage.

P405

Store locked up.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none**3. COMPOSITION/INFORMATION ON INGREDIENTS****3.1 Substances**

Formula	: C ₂₀ H ₁₂
Molecular weight	: 252.31 g/mol
CAS-No.	: 207-08-9
EC-No.	: 205-916-6
Index-No.	: 601-036-00-5

Hazardous components

Component	Classification	Concentration
Benzo[k]fluoranthene	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES**4.1 Description of first aid measures****General advice**

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

If inhaled

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

In case of skin contact

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

In case of eye contact

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

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Benzo[k]fluoranthene	207-08-9	PEL	0.2 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
	-	1-Hydroxypyrene	2.5 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		3-hydroxybenzo(a)pyrene		Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: crystalline |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 215 - 217 °C (419 - 423 °F) - lit. |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |

k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

Carcinogenicity - Rat - Implant

Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Lungs, Thorax, or Respiration: Tumors.

Tumorigenic: Tumors at site or application.

Carcinogenicity - Mouse - Skin

Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Skin and Appendages: Other: Tumors.

Tumorigenic: Tumors at site or application.

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benzo[k]fluoranthene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Benzo[k]fluoranthene)

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: DF6350000

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

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

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

Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benzo[k]fluoranthene)
Reportable Quantity (RQ): 5000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benzo[k]fluoranthene)
Marine pollutant:yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benzo[k]fluoranthene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	1993-02-16

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	1993-02-16

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	1993-02-16

California Prop. 65 Components

, which is/are known to the State of California to cause cancer.

For more information go to www.P65Warnings.ca.gov.

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute Acute aquatic toxicity

Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.12

Revision Date: 08/20/2018

Print Date: 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Beryllium

Product Number : 378135

Brand : Aldrich

CAS-No. : 7440-41-7

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

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301

Acute toxicity, Inhalation (Category 2), H330

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Skin sensitisation (Category 1), H317

Carcinogenicity (Category 1B), H350

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

Specific target organ toxicity - repeated exposure (Category 1), 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

Hazard statement(s)

H301

Toxic if swallowed.

H315

Causes skin irritation.

H317

May cause an allergic skin reaction.

H319

Causes serious eye irritation.

H330

Fatal if inhaled.

H335

May cause respiratory irritation.

H350

May cause cancer.

H372

Causes damage to organs 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/ vapours/ 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.
P272	Contaminated work clothing should not be allowed out of the workplace.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284	Wear respiratory protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash 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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: Be
Molecular weight	: 9.01 g/mol
CAS-No.	: 7440-41-7
EC-No.	: 231-150-7

Hazardous components

Component	Classification	Concentration
Beryllium foil	Acute Tox. 3; Acute Tox. 2; Skin Irrit. 2; Eye Irrit. 2A; Skin Sens. 1; Carc. 1B; STOT SE 3; STOT RE 1; H301, H315, H317, H319, H330, H335, H350, H372	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

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

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods 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.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

Storage class (TRGS 510): 4.1B: Flammable solid hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**8.1 Control parameters****Components with workplace control parameters**

Component	CAS-No.	Value	Control parameters	Basis
Beryllium foil	7440-41-7	TWA	2.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Peak	25.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		TWA	2.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
	Remarks	Z27.29-1970		
		CEIL	5.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		TWA	0.000050 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Beryllium sensitization Chronic beryllium disease (berylliosis) Confirmed human carcinogen Danger of cutaneous absorption Sensitizer		
		C	0.000500 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		See Table Z-2		
		TWA	2.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		TWA	2.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		TWA	0.000050 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Beryllium sensitization Chronic beryllium disease (berylliosis)		

		Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Confirmed human carcinogen Danger of cutaneous absorption Sensitizer		
		C	0.000500 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		See Table Z-2		
		TWA	2microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		C	0.0005 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		PEL	0.0002 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	0.025 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an

industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: powder
Colour: grey |
| b) Odour | odourless |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 1,278 °C (2,332 °F) - lit. |
| f) Initial boiling point and boiling range | 2,970 °C (5,378 °F) - lit. |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | 1.85 g/cm ³ at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition 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

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

Alkali metals

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Beryllium oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - 0.496 mg/kg

Remarks: Liver:Hepatitis (hepatocellular necrosis), zonal.

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Hamster

Lungs

Result: negative

Carcinogenicity

Carcinogenicity - Rat - Intratracheal

Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Lungs, Thorax, or Respiration:Bronchiogenic carcinoma.

Carcinogenicity - Rabbit - Intravenous

Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Musculoskeletal:Tumors.

Possible human carcinogen

IARC: 1 - Group 1: Carcinogenic to humans (Beryllium foil)

NTP: Known - Known to be human carcinogen (Beryllium foil)

Known - Known to be human carcinogenThe reference note has been added by TD based on the background information of the NTP. (Beryllium foil)

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: DS1750000

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

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

UN number: 1567 Class: 6.1 (4.1) Packing group: II

Proper shipping name: Beryllium, powder

Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1567 Class: 6.1 (4.1) Packing group: II EMS-No: F-G, S-G

Proper shipping name: BERYLLIUM POWDER

IATA

UN number: 1567 Class: 6.1 (4.1) Packing group: II

Proper shipping name: Beryllium powder

15. REGULATORY INFORMATION**SARA 302 Components**

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

SARA 313 Components

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

	CAS-No.	Revision Date
Berylium foil	7440-41-7	1993-04-24

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Berylium foil	7440-41-7	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Berylium foil	7440-41-7	1993-04-24

	CAS-No.	Revision Date
Berylium foil	7440-41-7	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Berylium foil	7440-41-7	1993-04-24

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

Berylium foil

CAS-No.	Revision Date
7440-41-7	2008-10-10

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
H301	Toxic if swallowed.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H330	Fatal if inhaled.
H335	May cause respiratory irritation.
H350	May cause cancer.
H372	Causes damage to organs through prolonged or repeated exposure.
Skin Irrit.	Skin irritation
Skin Sens.	Skin sensitisation

HMIS Rating

Health hazard:	4
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	4
Fire Hazard:	3
Reactivity Hazard:	3

Further information

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

Version: 4.8

Revision Date: 01/11/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 03/14/2018
Print Date 07/17/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : β -BHC
Product Number : 48494
Brand : Supelco
Index-No. : 602-042-00-0
CAS-No. : 319-85-7

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 Street
ST. LOUIS MO 63103
UNITED STATES
Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

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 3), H301

Acute toxicity, Dermal (Category 4), H312

Carcinogenicity (Category 2), H351

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)	
H301	Toxic if swallowed.
H312	Harmful in contact with skin.
H351	Suspected of causing cancer.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing.
P281	Use personal protective equipment as required.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: β -1,2,3,4,5,6-Hexachlorocyclohexane
Formula	: C ₆ H ₆ Cl ₆
Molecular weight	: 290.83 g/mol
CAS-No.	: 319-85-7
EC-No.	: 206-271-3
Index-No.	: 602-042-00-0

Hazardous components

Component	Classification	Concentration
(1α,2β,3α,4β,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane		
	Acute Tox. 3; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H312, H351, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Store at room temperature.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---------------------------------|-----------------------------------|
| a) Appearance | Form: solid
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | > 300.0 °C (> 572.0 °F) |

f)	Initial boiling point and boiling range	No data available
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	log Pow: 3.78
p)	Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 6,000 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

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

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

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: GV4375000

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

Blood -

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish LC50 - *Poecilia reticulata* (guppy) - 1.6 mg/l - 96.0 h((1 α ,2 β ,3 α ,4 β ,5 α ,6 β)-1,2,3,4,5,6-Hexachlorocyclohexane)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Bioaccumulation *Cyprinus carpio* (Carp) - 35 d
- 0.05 mg/l((1 α ,2 β ,3 α ,4 β ,5 α ,6 β)-1,2,3,4,5,6-Hexachlorocyclohexane)

Bioconcentration factor (BCF): 500

12.4 Mobility in soil

No data available((1 α ,2 β ,3 α ,4 β ,5 α ,6 β)-1,2,3,4,5,6-Hexachlorocyclohexane)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

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

Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. ((1 α ,2 β ,3 α ,4 β ,5 α ,6 β)-1,2,3,4,5,6-Hexachlorocyclohexane)
Reportable Quantity (RQ) : 1 lbs

noMarine pollutant: no
Poison Inhalation Hazard: No

IMDG

UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. ((1 α ,2 β ,3 α ,4 β ,5 α ,6 β)-1,2,3,4,5,6-Hexachlorocyclohexane)

IATA

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. ((1 α ,2 β ,3 α ,4 β ,5 α ,6 β)-1,2,3,4,5,6-Hexachlorocyclohexane)

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Acute Health Hazard, Chronic Health Hazard

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No. 319-85-7	Revision Date
(1 α ,2 β ,3 α ,4 β ,5 α ,6 β)-1,2,3,4,5,6-Hexachlorocyclohexane		

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H301	Toxic if swallowed.
H312	Harmful in contact with skin.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

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

NFPA Rating

Health hazard: 1
Fire Hazard: 0
Reactivity Hazard: 0

Further information

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

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 03/14/2018

Print Date: 07/17/2019

1. Identification

Product identifier	Bis(2-chloroethoxy)methane	
Other means of identification		
Product code	N-11211	
Recommended use	For Laboratory Use Only	
Recommended restrictions	None known.	
Manufacturer/Importer/Supplier/Distributor information		
Manufacturer		
Company name	Chem Service, Inc.	
Address	660 Tower Lane West Chester, PA 19380 United States	
Telephone	Toll Free	800-452-9994
	Direct	610-692-3026
Website	www.chemservice.com	
E-mail	info@chemservice.com	
Emergency phone number	Chemtrec US	800-424-9300
	Chemtrec outside US	+1 703-527-3887

2. Hazard(s) identification

Physical hazards	Not classified.	
Health hazards	Acute toxicity, oral	Category 2
	Acute toxicity, dermal	Category 2
	Acute toxicity, inhalation	Category 1
Environmental hazards	Not classified.	
OSHA defined hazards	Not classified.	
Label elements		



Signal word	Danger
Hazard statement	Fatal if swallowed. Fatal in contact with skin. Fatal if inhaled.
Precautionary statement	
Prevention	Use only outdoors or in a well-ventilated area. Do not breathe vapor. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/protective clothing. Wear respiratory protection.
Response	If swallowed: Immediately call a poison center/doctor. If on skin: Wash with plenty of water. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center/doctor. Specific treatment is urgent (see this label). Rinse mouth. Take off immediately all contaminated clothing and wash it before reuse.
Storage	Store in a well-ventilated place. Keep container tightly closed. Store locked up.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	None known.
Supplemental information	Not applicable.

3. Composition/information on ingredients**Substances**

Chemical name	Common name and synonyms	CAS number	%
Bis(2-chloroethoxy)methane		111-91-1	100

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Oxygen or artificial respiration if needed. Do not use mouth-to-mouth method if victim inhaled the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Call a physician or poison control center immediately.
Skin contact	Take off immediately all contaminated clothing. IF ON SKIN: Gently wash with plenty of soap and water. Call a physician or poison control center immediately.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician or poison control center immediately.
Ingestion	Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not use mouth-to-mouth method if victim ingested the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
General information	Take off immediately all contaminated clothing. In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse. Discard any shoes or clothing items that cannot be decontaminated.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO ₂).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire-fighting equipment/instructions	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Immediately evacuate personnel to safe areas. Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Wear appropriate protective equipment and clothing during clean-up. Do not breathe vapor. Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	<p>Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Absorb in vermiculite, dry sand or earth and place into containers. Prevent entry into waterways, sewer, basements or confined areas. Following product recovery, flush area with water.</p> <p>Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.</p> <p>Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.</p>
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Do not breathe vapor. Do not get this material in contact with eyes. Do not get this material in contact with skin. Do not taste or swallow. Do not get this material on clothing. Use only outdoors or in a well-ventilated area. Wear appropriate personal protective equipment. Observe good industrial hygiene practices. When using, do not eat, drink or smoke. Wash hands thoroughly after handling. Wash contaminated clothing before reuse.
Conditions for safe storage, including any incompatibilities	Store locked up. Store in original tightly closed container. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.
Individual protection measures, such as personal protective equipment	
Eye/face protection	Wear eye/face protection. If contact is likely, safety glasses with side shields are recommended.
Skin protection	
Hand protection	Wear protective gloves.
Other	Wear appropriate chemical resistant clothing.
Respiratory protection	Wear positive pressure self-contained breathing apparatus (SCBA).
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	When using, do not eat, drink or smoke. Do not get this material on clothing. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Physical state	Liquid.
Form	Liquid
Color	Colorless
Odor	Not available.
Odor threshold	Not available.
pH	Not available.
Melting point/freezing point	-27.04 °F (-32.8 °C)
Initial boiling point and boiling range	424.58 °F (218.1 °C)
Flash point	230.0 °F (110.0 °C) Open Cup
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	0.02 kPa at 25 °C
Vapor density	5.9
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	0.8
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Density	1.2338 g/cm ³ estimated
Flammability class	Combustible IIIB estimated
Molecular formula	C ₅ -H ₁₀ -Cl ₂ -O ₂
Molecular weight	173.05 g/mol
Specific gravity	1.23 at 20 °C

10. Stability and reactivity

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

11. Toxicological information

Information on likely routes of exposure

Ingestion	Fatal if swallowed.
Inhalation	Fatal if inhaled.
Skin contact	Fatal in contact with skin.
Eye contact	Direct contact with eyes may cause temporary irritation.

Symptoms related to the physical, chemical and toxicological characteristics Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity Fatal if inhaled. Fatal in contact with skin. Fatal if swallowed.

Product	Species	Test Results
Bis(2-chloroethoxy)methane (CAS 111-91-1)		
Acute		
<i>Dermal</i>		
LD50	Guinea pig	170 mg/kg
<i>Inhalation</i>		
LC50	Guinea pig	60 - 120 ppm
	Rat	0.05 - 0.5 mg/l, 4 Hours
<i>Oral</i>		
LD50	Rat	50 - 300 mg/kg

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

Skin corrosion/irritation Prolonged skin contact may cause temporary irritation.

Serious eye damage/eye irritation Direct contact with eyes may cause temporary irritation.

Respiratory or skin sensitization

Respiratory sensitization	Not available.
Skin sensitization	This product is not expected to cause skin sensitization.

Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity This product is not expected to cause reproductive or developmental effects.

Specific target organ toxicity - single exposure Not classified.

Specific target organ toxicity - repeated exposure Not classified.

Aspiration hazard Not available.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Product	Species	Test Results
Bis(2-chloroethoxy)methane (CAS 111-91-1)		
Aquatic		
Fish	LC50	Fathead minnow (Pimephales promelas) 155 - 217 mg/l, 96 hours

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

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential Not available.

Partition coefficient n-octanol / water (log Kow)
0.75

Mobility in soil No data available.

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

13. Disposal considerations

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

Local disposal regulations Dispose in accordance with all applicable regulations.

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

US RCRA Hazardous Waste U List: Reference

Bis(2-chloroethoxy)methane (CAS 111-91-1) U024

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

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

14. Transport information

DOT

UN number UN2810
UN proper shipping name Toxic, liquids, organic, n.o.s. (Bis(2-chloroethoxy)methane RQ = 1000 LBS)
Transport hazard class(es)
Class 6.1(PGI, II)
Subsidiary risk -
Label(s) 6.1
Packing group II
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.
Special provisions IB2, T11, TP2, TP13, TP27
Packaging exceptions 153
Packaging non bulk 202
Packaging bulk 243

IATA

UN number UN2810
UN proper shipping name Toxic liquid, organic, n.o.s. (Bis(2-chloroethoxy)methane)
Transport hazard class(es)
Class 6.1(PGI, II)
Subsidiary risk -
Packing group II
Environmental hazards No.
ERG Code 6L
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

Other information

Passenger and cargo aircraft Allowed.
Cargo aircraft only Allowed.

IMDG

UN number UN2810
UN proper shipping name TOXIC LIQUID, ORGANIC, N.O.S. (Bis(2-chloroethoxy)methane)

Transport hazard class(es)**Class** 6.1(PGI, II)**Subsidiary risk** -**Packing group** II**Environmental hazards****Marine pollutant** No.**EmS** F-A, S-A**Special precautions for user** Read safety instructions, SDS and emergency procedures before handling.**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** Not available.**DOT****IATA; IMDG****15. Regulatory information****US federal regulations**

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

All components are on the U.S. EPA TSCA Inventory List.

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

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Bis(2-chloroethoxy)methane (CAS 111-91-1) Listed.

SARA 304 Emergency release notification

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)**Hazard categories**

Immediate Hazard - Yes

Delayed Hazard - No

Fire Hazard - No

Pressure Hazard - No

Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes**SARA 313 (TRI reporting)**

Chemical name	CAS number	% by wt.
Bis(2-chloroethoxy)methane	111-91-1	100

Other federal regulations**Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List**

Not regulated.

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

Not regulated.

Clean Water Act (CWA) Section 112(r) (40 CFR 68.130) Priority pollutant
 Toxic pollutant

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations**US. Massachusetts RTK - Substance List**

Bis(2-chloroethoxy)methane (CAS 111-91-1)

US. New Jersey Worker and Community Right-to-Know Act

Bis(2-chloroethoxy)methane (CAS 111-91-1) 500 LBS

US. Pennsylvania RTK - Hazardous Substances

Bis(2-chloroethoxy)methane (CAS 111-91-1)

US. Rhode Island RTK

Bis(2-chloroethoxy)methane (CAS 111-91-1)

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

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

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

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

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

Issue date 04-09-2015
Version # 01
NFPA ratings Health: 2
 Flammability: 1
 Instability: 0

Disclaimer

The above information is believed to be correct on the date it was last revised and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded SDS must be made available to the employee within three months. RESPONSIBILITY for updates lies with the employer and not with CHEM SERVICE, Inc.

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

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

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This product is furnished FOR LABORATORY USE ONLY.

SAFETY DATA SHEET

Version 4.6
Revision Date 05/24/2016
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : 2-Chloroethyl ether

Product Number : C41134
Brand : Aldrich
Index-No. : 603-029-00-2

CAS-No. : 111-44-4

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 3), H226
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 1), H330
Acute toxicity, Dermal (Category 2), H310
Carcinogenicity (Category 2), H351

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H226

Flammable liquid and vapour.

H301

Toxic if swallowed.

H310 + H330

Fatal in contact with skin or if inhaled

H351

Suspected of causing cancer.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P262	Do not get in eyes, on skin, or on clothing.
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.
P284	Wear respiratory protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P310	Immediately call a POISON CENTER/doctor.
P320	Specific treatment is urgent (see supplemental first aid instructions on this label).
P330	Rinse mouth.
P361	Remove/ Take off immediately all contaminated clothing.
P363	Wash contaminated clothing before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

Lachrymator.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : Bis(2-chloroethyl) ether
2,2'-Dichlorodiethyl ether

Formula : C₄H₈Cl₂O
Molecular weight : 143.01 g/mol
CAS-No. : 111-44-4
EC-No. : 203-870-1
Index-No. : 603-029-00-2

Hazardous components

Component	Classification	Concentration
bis(2-Chloroethyl) ether		
	Flam. Liq. 3; Acute Tox. 3; Acute Tox. 1; Acute Tox. 2; Carc. 2; H226, H301, H310 + H330, H351	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas. For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Recommended storage temperature 2 - 8 °C

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
bis(2-Chloroethyl) ether	111-44-4	TWA	5.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation Eye irritation Nausea Not classifiable as a human carcinogen Danger of cutaneous absorption		
		STEL	10.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Eye irritation Nausea Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	5.000000 ppm 30.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A Potential for dermal absorption		
		ST	10.000000 ppm 60.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A Potential for dermal absorption		
		C	15.000000 ppm 90.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation The value in mg/m3 is approximate. Ceiling limit is to be determined from breathing-zone air samples.		
		PEL	5 ppm 30 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		STEL	10 ppm 60 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 480 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 30 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: liquid, clear
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -47 °C (-53 °F) - lit. |
| f) Initial boiling point and boiling range | 65 - 67 °C (149 - 153 °F) at 20 hPa (15 mmHg) - lit. |
| g) Flash point | 55.0 °C (131.0 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |

m) Relative density	1.22 g/cm ³ at 25 °C (77 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 75.0 mg/kg

LC50 Inhalation - Rat - 4 h - 330 mg/m³

LD50 Dermal - Rabbit - 90.0 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Open irritation test

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Severe irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

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

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

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

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: KN0875000

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - *Lepomis macrochirus* (Bluegill) - 600.00 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates EC50 - *Daphnia magna* (Water flea) - 240.00 mg/l - 48 h

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation *Lepomis macrochirus* (Bluegill) - 14 d
- 0.00991 mg/l

Bioconcentration factor (BCF): 11

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

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1916 Class: 6.1 (3) Packing group: II
Proper shipping name: 2,2'-Dichlorodiethyl ether
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1916 Class: 6.1 (3) Packing group: II EMS-No: F-E, S-D
Proper shipping name: 2,2'-DICHLORODIETHYL ETHER

IATA

UN number: 1916 Class: 6.1 (3) Packing group: II
Proper shipping name: 2,2'-Dichlorodiethyl ether

15. REGULATORY INFORMATION

SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
bis(2-Chloroethyl) ether	111-44-4	2007-07-01

SARA 313 Components

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

	CAS-No.	Revision Date
bis(2-Chloroethyl) ether	111-44-4	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
bis(2-Chloroethyl) ether	111-44-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
bis(2-Chloroethyl) ether	111-44-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
bis(2-Chloroethyl) ether	111-44-4	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
bis(2-Chloroethyl) ether	111-44-4	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Carc.	Carcinogenicity
Flam. Liq.	Flammable liquids
H226	Flammable liquid and vapour.
H301	Toxic if swallowed.
H310	Fatal in contact with skin.
H310 + H330	Fatal in contact with skin or if inhaled
H330	Fatal if inhaled.
H351	Suspected of causing cancer.

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	2
Physical Hazard	0

NFPA Rating

Health hazard:	3
Fire Hazard:	2
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.6

Revision Date: 05/24/2016

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 5.9
Revision Date 05/25/2016
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Bis(2-ethylhexyl) phthalate

Product Number : P6699
Brand : Sigma
Index-No. : 607-317-00-9

CAS-No. : 117-81-7

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture**

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Reproductive toxicity (Category 1B), H360

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)
H360 : May damage fertility or the unborn child.

Precautionary statement(s)
P201 : Obtain special instructions before use.
P202 : Do not handle until all safety precautions have been read and understood.
P281 : Use personal protective equipment as required.
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

Endocrine disrupting chemical(s)

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula : C₂₄H₃₈O₄
Molecular weight : 390.56 g/mol
CAS-No. : 117-81-7
EC-No. : 204-211-0
Index-No. : 607-317-00-9
Registration number : 01-2119484611-38-XXXX

Hazardous components

Component	Classification	Concentration
bis(2-Ethylhexyl) phthalate Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)		
	Repr. 1B; H360	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

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

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
bis(2-Ethylhexyl) phthalate	117-81-7	TWA	5.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Lower Respiratory Tract irritation Confirmed animal carcinogen with unknown relevance to humans		
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		ST	10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.2 mm
Break through time: 480 min
Material tested: Dermatril® P (KCL 743 / Aldrich Z677388, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 120 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: liquid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | -50.0 °C (-58.0 °F) |
| f) Initial boiling point and boiling range | 384.0 °C (723.2 °F) |
| g) Flash point | 207.0 °C (404.6 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Lower explosion limit: 0.3 %(V) |
| k) Vapour pressure | 1.6 hPa (1.2 mmHg) at 93.0 °C (199.4 °F) |
| l) Vapour density | No data available |
| m) Relative density | 0.98 g/cm ³ |
| n) Water solubility | insoluble |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition | 390.0 °C (734.0 °F) |

temperature

- 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 30,000 mg/kg

Inhalation: No data available

LD50 Dermal - Rabbit - 25,000 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Mild skin irritation - 24 h

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Mild eye irritation - 24 h

Respiratory or skin sensitisation

Maximisation Test - Guinea pig

Result: Does not cause skin sensitisation.

(OECD Test Guideline 406)

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (bis(2-Ethylhexyl) phthalate)
NTP: Reasonably anticipated to be a human carcinogen (bis(2-Ethylhexyl) phthalate)
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

May cause congenital malformation in the fetus.
Presumed human reproductive toxicant

May cause reproductive disorders.

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: TI0350000

Effects due to ingestion may include:, Gastrointestinal disturbance

Kidney -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - > 0.67 mg/l - 96 h LC50 - Oncorhynchus mykiss (rainbow trout) - > 0.32 mg/l - 96 h LC50 - Cyprinodon variegatus (sheepshead minnow) - > 0.17 mg/l - 96 h LC50 - Lepomis macrochirus (Bluegill) - > 0.20 mg/l - 96 h NOEC - other fish - > 0.3 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - > 0.16 mg/l - 48 h

12.2 Persistence and degradability

Biodegradability	Result: - Readily biodegradable (OECD Test Guideline 301)
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12.3 Bioaccumulative potential

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 100 d - 0.014 mg/l Bioconcentration factor (BCF): 113 Remarks: Does not bioaccumulate.
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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

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (bis(2-Ethylhexyl) phthalate)
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG

Not dangerous goods

IATA

Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
bis(2-Ethylhexyl) phthalate	117-81-7	2007-07-01

SARA 311/312 Hazards

Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
bis(2-Ethylhexyl) phthalate	117-81-7	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
bis(2-Ethylhexyl) phthalate	117-81-7	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
bis(2-Ethylhexyl) phthalate	117-81-7	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. bis(2-Ethylhexyl) phthalate	117-81-7	2009-02-01

	CAS-No.	Revision Date
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. bis(2-Ethylhexyl) phthalate	117-81-7	2009-02-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H360 May damage fertility or the unborn child.
Repr. Reproductive toxicity

HMIS Rating

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

NFPA Rating

Health hazard: 0
Fire Hazard: 1
Reactivity Hazard: 0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.9

Revision Date: 05/25/2016

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 5.5
Revision Date 05/24/2016
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Benzyl butyl phthalate

Product Number : 308501
Brand : Aldrich
Index-No. : 607-430-00-3

CAS-No. : 85-68-7

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Reproductive toxicity (Category 1B), H360
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H360

May damage fertility or the unborn child.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P273

Avoid release to the environment.

P281

Use personal protective equipment as required.

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P391

Collect spillage.

P405
P501

Store locked up.
Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula : C₁₉H₂₀O₄
Molecular weight : 312.36 g/mol
CAS-No. : 85-68-7
EC-No. : 201-622-7
Index-No. : 607-430-00-3

Hazardous components

Component	Classification	Concentration
Benzyl butyl phthalate Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)		
	Repr. 1B; Aquatic Acute 1; Aquatic Chronic 1; H360, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 480 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact

Material: Nature latex/chloroprene

Minimum layer thickness: 0.6 mm

Break through time: 60 min

Material tested:Lapren® (KCL 706 / Aldrich Z677558, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: liquid
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/freezing point: < -34.99 °C (< -30.98 °F) |
| f) Initial boiling point and boiling range | 370 °C (698 °F) |
| g) Flash point | 113.0 °C (235.4 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 19.2 hPa (14.4 mmHg) at 250.0 °C (482.0 °F)
0.3 hPa (0.2 mmHg) at 150.0 °C (302.0 °F) |
| l) Vapour density | No data available |
| m) Relative density | 1.1 g/cm ³ at 25 °C (77 °F) |
| n) Water solubility | 0.00269 g/l at 25 °C (77 °F) - OECD Test Guideline 105 - slightly soluble |
| o) Partition coefficient: n-octanol/water | log Pow: 4.91 at 20 °C (68 °F) |
| p) Auto-ignition temperature | 232.0 °C (449.6 °F) |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |

t) Oxidizing properties No data available

9.2 Other safety information

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, Strong bases

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male and female - 2,330 mg/kg
(OECD Test Guideline 401)

Inhalation: No data available

LD50 Dermal - Rabbit - > 10,000 mg/kg

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

- Guinea pig

Result: Does not cause skin sensitisation.

Germ cell mutagenicity

Ames test

S. typhimurium

Result: negative

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (Benzyl butyl phthalate)

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

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

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

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

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

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

Reproductive toxicity

Presumed human reproductive toxicant

Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

Repeated dose toxicity Rat - male - Oral - NOAEL : 550 mg/kg

RTECS: TH9990000

May cause endocrine disruption.

pancreas -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - *Lepomis macrochirus* (Bluegill) - 1.7 mg/l - 96.0 h
NOEC - *Oncorhynchus mykiss* (rainbow trout) - 0.48 mg/l - 96.0 h
flow-through test LC50 - *Pimephales promelas* (fathead minnow) - 2.1 mg/l - 96 h
(OECD Test Guideline 203)

Toxicity to daphnia and other aquatic invertebrates static test LC50 - *Daphnia magna* (Water flea) - 1.8 mg/l - 48 h

Toxicity to algae Growth inhibition EC50 - *Desmodesmus subspicatus* (green algae) - 0.31 mg/l - 72 h
(OECD Test Guideline 201)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 14 d
Result: 81 % - Readily biodegradable

12.3 Bioaccumulative potential

Bioaccumulation *Lepomis macrochirus* (Bluegill) - 21 d - 0.00973 mg/l

Bioconcentration factor (BCF): 663

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (Benzyl butyl phthalate)
Reportable Quantity (RQ): 100 lbs
Marine pollutant:yes
Poison Inhalation Hazard: No

IMDG

UN number: 3082 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Benzyl butyl phthalate)
Marine pollutant:yes

IATA

UN number: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (Benzyl butyl phthalate)

15. REGULATORY INFORMATION

SARA 302 Components

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

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.

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benzyl butyl phthalate	85-68-7	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benzyl butyl phthalate	85-68-7	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benzyl butyl phthalate	85-68-7	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Benzyl butyl phthalate	85-68-7	2007-09-28

	CAS-No.	Revision Date
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Benzyl butyl phthalate	85-68-7	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H360	May damage fertility or the unborn child.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
Repr.	Reproductive toxicity

HMIS Rating

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

NFPA Rating

Health hazard:	1
Fire Hazard:	1
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.5

Revision Date: 05/24/2016

Print Date: 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Beryllium

Product Number : 378135

Brand : Aldrich

CAS-No. : 7440-41-7

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

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301

Acute toxicity, Inhalation (Category 2), H330

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Skin sensitisation (Category 1), H317

Carcinogenicity (Category 1B), H350

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

Specific target organ toxicity - repeated exposure (Category 1), 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

Hazard statement(s)

H301

Toxic if swallowed.

H315

Causes skin irritation.

H317

May cause an allergic skin reaction.

H319

Causes serious eye irritation.

H330

Fatal if inhaled.

H335

May cause respiratory irritation.

H350

May cause cancer.

H372

Causes damage to organs 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/ vapours/ 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.
P272	Contaminated work clothing should not be allowed out of the workplace.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284	Wear respiratory protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash 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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: Be
Molecular weight	: 9.01 g/mol
CAS-No.	: 7440-41-7
EC-No.	: 231-150-7

Hazardous components

Component	Classification	Concentration
Beryllium foil	Acute Tox. 3; Acute Tox. 2; Skin Irrit. 2; Eye Irrit. 2A; Skin Sens. 1; Carc. 1B; STOT SE 3; STOT RE 1; H301, H315, H317, H319, H330, H335, H350, H372	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

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

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods 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.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

Storage class (TRGS 510): 4.1B: Flammable solid hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**8.1 Control parameters****Components with workplace control parameters**

Component	CAS-No.	Value	Control parameters	Basis
Beryllium foil	7440-41-7	TWA	2.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Peak	25.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		TWA	2.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
	Remarks	Z27.29-1970		
		CEIL	5.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		TWA	0.000050 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Beryllium sensitization Chronic beryllium disease (berylliosis) Confirmed human carcinogen Danger of cutaneous absorption Sensitizer		
		C	0.000500 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		See Table Z-2		
		TWA	2.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		TWA	2.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		TWA	0.000050 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Beryllium sensitization Chronic beryllium disease (berylliosis)		

		Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Confirmed human carcinogen Danger of cutaneous absorption Sensitizer		
		C	0.000500 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		See Table Z-2		
		TWA	2microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		C	0.0005 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		PEL	0.0002 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	0.025 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an

industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: powder
Colour: grey |
| b) Odour | odourless |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 1,278 °C (2,332 °F) - lit. |
| f) Initial boiling point and boiling range | 2,970 °C (5,378 °F) - lit. |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | 1.85 g/cm ³ at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition 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

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

Alkali metals

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Beryllium oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - 0.496 mg/kg

Remarks: Liver:Hepatitis (hepatocellular necrosis), zonal.

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Hamster

Lungs

Result: negative

Carcinogenicity

Carcinogenicity - Rat - Intratracheal

Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Lungs, Thorax, or Respiration:Bronchiogenic carcinoma.

Carcinogenicity - Rabbit - Intravenous

Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Musculoskeletal:Tumors.

Possible human carcinogen

IARC: 1 - Group 1: Carcinogenic to humans (Beryllium foil)

NTP: Known - Known to be human carcinogen (Beryllium foil)

Known - Known to be human carcinogenThe reference note has been added by TD based on the background information of the NTP. (Beryllium foil)

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: DS1750000

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

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

UN number: 1567 Class: 6.1 (4.1) Packing group: II

Proper shipping name: Beryllium, powder

Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1567 Class: 6.1 (4.1) Packing group: II EMS-No: F-G, S-G

Proper shipping name: BERYLLIUM POWDER

IATA

UN number: 1567 Class: 6.1 (4.1) Packing group: II

Proper shipping name: Beryllium powder

15. REGULATORY INFORMATION**SARA 302 Components**

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

SARA 313 Components

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

	CAS-No.	Revision Date
Berylium foil	7440-41-7	1993-04-24

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Berylium foil	7440-41-7	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Berylium foil	7440-41-7	1993-04-24

	CAS-No.	Revision Date
Berylium foil	7440-41-7	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Berylium foil	7440-41-7	1993-04-24

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Berylium foil	7440-41-7	2008-10-10

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
H301	Toxic if swallowed.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H330	Fatal if inhaled.
H335	May cause respiratory irritation.
H350	May cause cancer.
H372	Causes damage to organs through prolonged or repeated exposure.
Skin Irrit.	Skin irritation
Skin Sens.	Skin sensitisation

HMIS Rating

Health hazard:	4
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	4
Fire Hazard:	3
Reactivity Hazard:	3

Further information

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

Version: 4.8

Revision Date: 01/11/2018

Print Date: 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Calcium

Product Number : 215147

Brand : Aldrich

Index-No. : 020-001-00-X

CAS-No. : 7440-70-2

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Substances and mixtures, which in contact with water, emit flammable gases (Category 2), H261

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)
H261

In contact with water releases flammable gases.

Precautionary statement(s)
P223

Keep away from any possible contact with water, because of violent reaction and possible flash fire.

P231 + P232
P280
P335 + P334

Handle under inert gas. Protect from moisture.
Wear protective gloves/ eye protection/ face protection.
Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.

P370 + P378

In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.

P402 + P404
P501

Store in a dry place. Store in a closed container.
Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula : Ca
Molecular weight : 40.08 g/mol
CAS-No. : 7440-70-2
EC-No. : 231-179-5
Index-No. : 020-001-00-X

Hazardous components

Component	Classification	Concentration
Calcium		
	Water-react. 2; H261	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Dry powder

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Never allow product to get in contact with water during storage.

Handle and store under inert gas. Air sensitive.

Storage class (TRGS 510): Hazardous materials, which set free flammable gases upon contact with water

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an

industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: granular
Colour: silver |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 850 °C (1,562 °F) - lit. |
| f) Initial boiling point and boiling range | 1,484 °C (2,703 °F) - lit. |
| g) Flash point | Not applicable |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | 1.54 g/mL at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition 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

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

Reacts violently with water.

10.4 Conditions to avoid

Exposure to moisture

10.5 Incompatible materials

Strong oxidizing agents, Alcohols

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Calcium oxide

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

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

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

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

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

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

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Cough, Shortness of breath, Headache, Nausea

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

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

Contaminated packaging

Dispose of as unused product.

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

UN number: 1401 Class: 4.3

Packing group: II

Proper shipping name: Calcium

Reportable Quantity (RQ):

Poison Inhalation Hazard: No

IMDG

UN number: 1401 Class: 4.3

Packing group: II

EMS-No: F-G, S-O

Proper shipping name: CALCIUM

IATA

UN number: 1401 Class: 4.3

Packing group: II

Proper shipping name: Calcium

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Reactivity Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Calcium	7440-70-2	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Calcium	7440-70-2	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Calcium	7440-70-2	1993-04-24

California Prop. 65 Components

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

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H261	In contact with water releases flammable gases.
Water-react.	Substances and mixtures, which in contact with water, emit flammable gases

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	
Flammability:	3
Physical Hazard	1

NFPA Rating

Health hazard:	0
Fire Hazard:	3
Reactivity Hazard:	1
Special hazard.I:	W

Further information

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

Version: 4.9

Revision Date: 05/24/2016

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 05/28/2017
Print Date 06/29/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Carbazole

Product Number : C5132

Brand : Sigma

CAS-No. : 86-74-8

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Carcinogenicity (Category 2), H351

Chronic aquatic toxicity (Category 4), H413

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

Warning

Hazard statement(s)

H351

Suspected of causing cancer.

H413

May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P273

Avoid release to the environment.

P281

Use personal protective equipment as required.

P308 + P313
P405
P501

IF exposed or concerned: Get medical advice/ attention.
Store locked up.
Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula : C₁₂H₉N
Molecular weight : 167.21 g/mol
CAS-No. : 86-74-8
EC-No. : 201-696-0

Hazardous components

Component	Classification	Concentration
Carbazole		
	Carc. 2; Aquatic Chronic 4; H351, H413	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Nitrogen oxides (NO_x)

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combu formation should be taken into consideration before additional processing
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (EN 143) respirator cartridges as a backup to engineering controls. If th full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: powder
Colour: beige |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 243 - 246 °C (469 - 475 °F) |
| f) Initial boiling point and boiling range | 355 °C (671 °F) |
| g) Flash point | 220.0 °C (428.0 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | The product is not flammable. |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 533 hPa at 323 °C (613 °F) |
| l) Vapour density | No data available |
| m) Relative density | 1.1 g/cm ³ at 18 °C (64 °F) |
| n) Water solubility | 0.00091 g/l at 25 °C (77 °F) |
| o) Partition coefficient: n-octanol/water | log Pow: 3.72 at 22 °C (72 °F) |
| p) Auto-ignition temperature | > 600 °C (> 1112 °F) at 1,013 hPa |
| 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

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

Oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Nitrogen oxides (NOx)

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD0 Oral - Rat - > 16,000 mg/kg(Carbazole)

(OECD Test Guideline 401)

Inhalation: No data available(Carbazole)

Dermal: No data available(Carbazole)

No data available(Carbazole)

Skin corrosion/irritation

Skin - Rabbit(Carbazole)

Result: No skin irritation

(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit(Carbazole)

Result: No eye irritation

Respiratory or skin sensitisation

No data available(Carbazole)

Germ cell mutagenicity

No data available(Carbazole)

Carcinogenicity

Limited evidence of carcinogenicity in animal studies(Carbazole)

(Carbazole)

(Carbazole)

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Carbazole)

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

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

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

Reproductive toxicity

No data available(Carbazole)

No data available(Carbazole)

Specific target organ toxicity - single exposure

No data available(Carbazole)

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available(Carbazole)

Additional Information

RTECS: FE3150000

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - > 0.93 mg/l - 96.0 h(Carbazole) Remarks: No toxicity at the limit of solubility
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 2.30 - 4.90 mg/l - 48 h(Carbazole) Remarks: No toxicity at the limit of solubility
Toxicity to algae	Growth inhibition NOEC - Scenedesmus acuminatus - > 0.4 mg/l - 96 h(Carbazole) Remarks: No toxicity at the limit of solubility

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Bioaccumulation	Cyprinus carpio (Carp) - 42 d - 0.05 mg/l(Carbazole) Bioconcentration factor (BCF): 241 Cyprinus carpio (Carp) - 42 d - 0.005 mg/l(Carbazole) Bioconcentration factor (BCF): 200
-----------------	---

12.4 Mobility in soil

No data available(Carbazole)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

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

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chem scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

Not dangerous goods

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Carbazole)
Marine pollutant : yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Carbazole)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Chronic Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Carbazole	86-74-8	2009-07-17

New Jersey Right To Know Components

	CAS-No.	Revision Date
Carbazole	86-74-8	2009-07-17

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Carbazole	86-74-8	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H351 Suspected of causing cancer.
H413 May cause long lasting harmful effects to aquatic life.

HMIS Rating

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

NFPA Rating

Health hazard: 2
Fire Hazard: 0
Reactivity Hazard: 0
Health hazard: 2
Fire Hazard: 1
Reactivity Hazard: 0

Further information

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

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 05/28/2017

Print Date: 06/29/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 05/28/2017
Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Carbon disulfide

Product Number : 335266
Brand : Sigma-Aldrich
Index-No. : 006-003-00-3

CAS-No. : 75-15-0

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 2), H225
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), H372
Acute aquatic toxicity (Category 2), H401

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H225
H315
H319

Highly flammable liquid and vapour.
Causes skin irritation.
Causes serious eye irritation.

H332	Harmful if inhaled.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure if inhaled.
H401	Toxic to aquatic life.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: CS<SB>2</>
Molecular weight	: 76.14 g/mol
CAS-No.	: 75-15-0
EC-No.	: 200-843-6
Index-No.	: 006-003-00-3

Hazardous components

Component	Classification	Concentration
Carbon disulphide	Flam. Liq. 2; Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; Repr. 2; STOT RE 1; Aquatic Acute 2; H225, H315, H319, H332, H361, H372, H401	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

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

If swallowed

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

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Sulphur oxides

Flash back possible over considerable distance., Container explosion may occur under fire conditions., Vapours may form explosive mixture with air., May explode when heated.

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

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

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

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

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

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Refrigerate before opening.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Carbon disulphide	75-15-0	TWA	1 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Peripheral Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	1.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Peripheral Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	20.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		
		CEIL	30.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		
		Peak	100.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		
		TWA	1.000000 ppm 3.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		ST	10.000000 ppm 30.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		See Table Z-2		
		TWA	20 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		
		CEIL	30 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		
		Peak	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Carbon disulphide	75-15-0	2-Thiothiazolidine-4-carboxylic acid (TTCA)	0.5000 mg/g	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

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

Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

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

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engine protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- a) Appearance Form: liquid
 Colour: colourless

- b) Odour Stench.

c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: -112 - -111 °C (-170 - -168 °F)
f) Initial boiling point and boiling range	46 °C (115 °F)
g) Flash point	-30 °C (-22 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	Upper explosion limit: 50 %(V) Lower explosion limit: 1.3 %(V)
k) Vapour pressure	394.956 hPa at 20 °C (68 °F) 1,342.711 hPa at 55 °C(131 °F)
l) Vapour density	2.63 - (Air = 1.0)
m) Relative density	1.266 g/mL at 25 °C (77 °F)
n) Water solubility	2.9 g/l at 20 °C (68 °F) - OECD Test Guideline 105
o) Partition coefficient: n-octanol/water	log Pow: 2.7 at 25 °C (77 °F)
p) Auto-ignition temperature	97 - 107 °C (207 - 225 °F)
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety information

Surface tension	71.9 mN/m at 19.5 °C (67.1 °F)
Relative vapour density	2.63 - (Air = 1.0)

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

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Alkali metals, Zinc, Amines, Azides, Oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Sulphur oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - female - > 2,000 mg/kg(Carbon disulphide)

(OECD Test Guideline 423)

LC50 Inhalation - Rat - male and female - 4 h - 10.35 mg/l(Carbon disulphide)

(OECD Test Guideline 403)

Dermal: No data available(Carbon disulphide)

No data available(Carbon disulphide)

Skin corrosion/irritation

No data available(Carbon disulphide)

Serious eye damage/eye irritation

No data available(Carbon disulphide)

Respiratory or skin sensitisation

- Mouse(Carbon disulphide)

Result: Does not cause skin sensitisation.

(OECD Test Guideline 429)

Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.(Carbon disulphide)

Ames test(Carbon disulphide)

Salmonella typhimurium

Result: negative

Carcinogenicity

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

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

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

Reproductive toxicity

Suspected human reproductive toxicant(Carbon disulphide)

May cause reproductive disorders.(Carbon disulphide)

Specific target organ toxicity - single exposure

No data available(Carbon disulphide)

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available(Carbon disulphide)

Additional Information

RTECS: FF6650000

May cause convulsions.(Carbon disulphide)

Liver - Irregularities - Based on Human Evidence

Liver - Irregularities - Based on Human Evidence(Carbon disulphide)

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Poecilia reticulata (guppy) - 4 mg/l - 96 h(Carbon disulphide) (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 2.1 mg/l - 48 h(Carbon disulphide) (OECD Test Guideline 202)
Toxicity to algae	Growth inhibition EC50 - Chlorella pyrenoidosa - 21 mg/l - 96 h(Carbon disulphide) (OECD Test Guideline 201)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 d(Carbon disulphide)
Result: > 80 % - Readily biodegradable.
(OECD Test Guideline 301D)

12.3 Bioaccumulative potential

12.4 Mobility in soil

No data available(Carbon disulphide)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1131 Class: 3 (6.1) Packing group: I
Proper shipping name: Carbon disulfide
Reportable Quantity (RQ) : 100 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1131 Class: 3 (6.1) Packing group: I EMS-No: F-E, S-D
Proper shipping name: CARBON DISULPHIDE

IATA

UN number: 1131 Class: 3 (6.1)
Proper shipping name: Carbon disulphide
IATA Passenger: Not permitted for transport
IATA Cargo: Not permitted for transport

15. REGULATORY INFORMATION

SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Carbon disulphide	75-15-0	2007-07-01

SARA 313 Components

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

	CAS-No.	Revision Date
Carbon disulphide	75-15-0	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Carbon disulphide	75-15-0	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Carbon disulphide	75-15-0	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Carbon disulphide	75-15-0	2007-07-01

California Prop. 65 Components

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

	CAS-No.	Revision Date
Carbon disulphide	75-15-0	2008-06-17

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H225	Highly flammable liquid and vapour.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure if inhaled.
H401	Toxic to aquatic life.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

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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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 05/28/2017

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 06/17/2019
Print Date 07/17/2019

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Chlordane (mixture of isomers)
Product Number : 40089
Brand : Supelco
Index-No. : 603-001-00-X

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 Street
ST. LOUIS MO 63103
UNITED STATES
Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

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 3), H301
Acute toxicity, Inhalation (Category 3), H331
Acute toxicity, Dermal (Category 3), H311
Specific target organ toxicity - single exposure (Category 1), Eyes, H370

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301 + H311 + H331
H370

Toxic if swallowed, in contact with skin or if inhaled.
Causes damage to organs (Eyes).

Precautionary statement(s)

P260
P264

Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
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.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of water. Call a POISON CENTER/doctor if you feel unwell.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor.
P307 + P311	IF exposed: Call a POISON CENTER or doctor/ physician.
P362	Take off contaminated clothing and wash 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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Component	Classification	Concentration
Methanol		
CAS-No. 67-56-1 EC-No. 200-659-6 Index-No. 603-001-00-X Registration number 01-2119433307-44-XXXX	Flam. Liq. 2; Acute Tox. 3; STOT SE 1; H225, H301, H331, H311, H370	>= 90 - <= 100 %
Chlordane		
CAS-No. 57-74-9 EC-No. 200-349-0 Index-No. 602-047-00-8	Acute Tox. 3; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H311, H351, H400, H410 M-Factor - Aquatic Acute: 10	< 0.1 %

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

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures**6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage**7.1 Precautions for safe handling**

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

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Recommended storage temperature 2 - 8 °C
Storage class (TRGS 510): 3: Flammable liquids

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

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Methanol	67-56-1	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Headache Nausea Dizziness Eye damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Danger of cutaneous absorption		
		STEL	250 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Headache Nausea Dizziness Eye damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Danger of cutaneous absorption		
		TWA	200 ppm 260 mg/m ³	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		ST	250 ppm 325 mg/m ³	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		TWA	200 ppm 260 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m ³ is approximate.		
		C	1,000 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

		PEL	200 ppm 260 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		STEL	250 ppm 325 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
Chlordane	57-74-9	TWA	0.500000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Liver damage Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.500000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A Potential for dermal absorption		
		TWA	0.500000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		PEL	0.5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Methanol	67-56-1	Methanol	15 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 480 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 30 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|--|-------------------|
| a) Appearance | Form: liquid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | No data available |
| f) Initial boiling point and boiling range | No data available |

g)	Flash point	()No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition 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

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

Acids, Oxidizing agents, Alkali metals, Acid chlorides, Acid anhydrides, Reducing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

Methyl alcohol may be fatal or cause blindness if swallowed., Cannot be made non-poisonous., Effects due to ingestion may include: , Nausea, Dizziness, Gastrointestinal disturbance, Weakness, Confusion., Drowsiness, Unconsciousness, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

SECTION 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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

UN number: 1230 Class: 3 Packing group: II
Proper shipping name: MethanoISOLUTION

Reportable Quantity (RQ): 5000 lbs

Reportable Quantity (RQ): 1 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1230 Class: 3 (6.1) Packing group: II EMS-No: F-E, S-D
Proper shipping name: METHANOLSOLUTION

IATA

UN number: 1230 Class: 3 (6.1) Packing group: II
Proper shipping name: MethanoISOLUTION

SECTION 15: Regulatory information

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01

SARA 311/312 Hazards

Chronic Health Hazard

Reportable Quantity : D020 lbs

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01
Chlordane	57-74-9	2007-07-01

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Methanol	CAS-No. 67-56-1	Revision Date 2007-07-01
Chlordane	57-74-9	2007-07-01
Methanol	CAS-No. 67-56-1	Revision Date 2007-07-01

New Jersey Right To Know Components

Methanol	CAS-No. 67-56-1	Revision Date 2007-07-01
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SECTION 16: Other information

Further information

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

www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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: 6.0

Revision Date: 06/17/2019

Print Date: 07/17/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Chlordane (technical mixture)

Product Number : 45378
Brand : Sigma-Aldrich

CAS-No. : 12789-03-6

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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, Dermal (Category 4), H312
Carcinogenicity (Category 2), H351
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H302 + H312
H351
H410

Harmful if swallowed or in contact with skin.
Suspected of causing cancer.
Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201
P202

Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.

P264
P270
P273

Wash skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Avoid release to the environment.

P280	Wear protective gloves/ protective clothing.
P301 + P312	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P322	Specific measures (see supplemental first aid instructions on this label).
P330	Rinse mouth.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Chlordane
Formula	:	C ₁₀ H ₆ Cl ₈
Molecular weight	:	409.78 g/mol
CAS-No.	:	12789-03-6

Hazardous components

Component	Classification	Concentration
Chlordane		
	Acute Tox. 4; Carc. 2; H302 + H312, H351	90 - 100 %
Chlordane		
	Acute Tox. 3; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301 + H311, H351, H410	1 - 5 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

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

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Chlordane	12789-03-6	TWA	0.5 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.5 mg/m ³	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A Potential for dermal absorption		

		TWA	0.5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		PEL	0.5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
	57-74-9	TWA	0.5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Liver damage Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.5 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A Potential for dermal absorption		
		TWA	0.5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		PEL	0.5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Body Protection

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

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|--------------------|-------------------|
| a) Appearance | Form: liquid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |

d) pH	No data available
e) Melting point/freezing point	No data available
f) Initial boiling point and boiling range	No data available
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	1.59 g/cm ³
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 367 mg/kg

Inhalation: No data available

LD50 Dermal - Rat - > 1,600 mg/kg

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Mouse

lymphocyte

Mutation in mammalian somatic cells.

Carcinogenicity

Suspected human carcinogens

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Chlordane)

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Chlordane)

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

Central nervous system depression, Headache, Abdominal pain, Vomiting

Nerves. - (Chlordane)

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

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

Very toxic to aquatic life with long lasting effects.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2810 Class: 6.1 Packing group: III
Proper shipping name: Toxic, liquids, organic, n.o.s. (Chlordane)
Reportable Quantity (RQ): 1 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 2810 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC LIQUID, ORGANIC, N.O.S. (Chlordane)

IATA

UN number: 2810 Class: 6.1 Packing group: III
Proper shipping name: Toxic liquid, organic, n.o.s. (Chlordane)

15. REGULATORY INFORMATION

SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Chlordane	57-74-9	2007-07-01
Chlordane	12789-03-6	2007-07-01

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

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Chlordane	12789-03-6	2007-07-01
Chlordane	57-74-9	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Chlordane	12789-03-6	2007-07-01
Chlordane	57-74-9	2007-07-01

	CAS-No.	Revision Date
Chlordane	12789-03-6	2007-07-01
Chlordane	57-74-9	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Chlordane	12789-03-6	2007-07-01
Chlordane	57-74-9	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

Chlordane
Chlordane

CAS-No.
57-74-9

12789-03-6

Revision Date
2007-09-28

2007-09-28

16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H301 + H311	Toxic if swallowed or in contact with skin.
H302	Harmful if swallowed.
H302 + H312	Harmful if swallowed or in contact with skin.
H312	Harmful in contact with skin.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

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

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.6

Revision Date: 03/06/2018

Print Date: 11/10/2018

SAFETY DATA SHEET

Version 3.18
Revision Date 08/14/2018
Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Chloroform

Product Number : C2432
Brand : Sigma-Aldrich
Index-No. : 602-006-00-4

CAS-No. : 67-66-3

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H331
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 2), H361d
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Specific target organ toxicity - repeated exposure (Category 1), Liver, Kidney, H372
Acute aquatic toxicity (Category 3), H402

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H331	Toxic if inhaled.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.

H361d	Suspected of damaging the unborn child.
H372	Causes damage to organs (Liver, Kidney) through prolonged or repeated exposure.
H402	Harmful to aquatic life.
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/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash 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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Trichloromethane Methyldyne trichloride
Formula	:	CHCl ₃
Molecular weight	:	119.38 g/mol
CAS-No.	:	67-66-3
EC-No.	:	200-663-8
Index-No.	:	602-006-00-4

Hazardous components

Component	Classification	Concentration
Chloroform	Acute Tox. 4; Acute Tox. 3; Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; Repr. 2; STOT SE 3; STOT RE 1; Aquatic Acute 3; H302, H315, H319, H331, H336, H351, H361d, H372, H402	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

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

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

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

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Chloroform	67-66-3	TWA	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Liver damage Embryo/fetal damage Confirmed animal carcinogen with unknown relevance to humans		
		ST	2 ppm 9.78 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		C	50 ppm 240 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate. Ceiling limit is to be determined from breathing-zone air samples.		
		PEL	2 ppm 9.78 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

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

Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

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

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: liquid, clear
Colour: colourless |
| b) Odour | sweet |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -63 °C (-81 °F) |
| f) Initial boiling point and boiling range | 60.5 - 61.5 °C (140.9 - 142.7 °F) |
| g) Flash point | - DIN 51755 Part 1 does not flash |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 210 hPa (158 mmHg) at 20 °C (68 °F) |
| l) Vapour density | 4.12 - (Air = 1.0) |
| m) Relative density | 1.492 g/mL at 25 °C (77 °F) |
| n) Water solubility | 8.7 g/l at 23 °C (73 °F) - OECD Test Guideline 105 |
| o) Partition coefficient: n-octanol/water | log Pow: 1.97 at 25 °C (77 °F) - (ECHA), Bioaccumulation is not expected. |
| p) Auto-ignition temperature | > 600 °C (> 1,112 °F) at 1,013 hPa (760 mmHg) - DIN 51794 |
| q) Decomposition temperature | Distillable in an undecomposed state at normal pressure. |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety information

- | | |
|------------------------------|---|
| Solubility in other solvents | organic solvent at 20 °C (68 °F) - miscible |
| Surface tension | 27.1 mN/m at 20.0 °C (68.0 °F) |
| Relative vapour density | 4.12 - (Air = 1.0) |

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

Contains the following stabiliser(s):

2-Methyl-2-butene (≥ 0.001 - ≤ 0.015 %)

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

various plastics, Rubber

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male - 908 mg/kg

(OECD Test Guideline 401)

Remarks: Behavioral:Change in motor activity (specific assay). Behavioral:Ataxia. Lungs, Thorax, or Respiration:Respiratory stimulation.

LOEC Inhalation - Rat - male - 6 h - 500 ppm

Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

LD50 Dermal - Rabbit - $> 20,000$ mg/kg

Remarks: (RTECS)

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Irritating to skin. - 24 h

Remarks: (ECHA)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Irritating to eyes.

Remarks: (ECHA)

Respiratory or skin sensitisation

Sensitisation test: - Guinea pig

Result: negative

(Maximisation Test)

Remarks: (ECHA)

Germ cell mutagenicity

Ames test

Salmonella typhimurium

Result: negative

reverse mutation assay

Escherichia coli

Result: negative

(ECHA)

OECD Test Guideline 474
Rat - male and female - Bone marrow
Result: negative

OECD Test Guideline 486
Rat - male - Other cell types
Result: negative

Carcinogenicity

Carcinogenicity - Rat - Oral
Tumorigenic: Carcinogenic by RTECS criteria. Leukaemia

Suspected of causing cancer.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Chloroform)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Chloroform)

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

Suspected of damaging the unborn child.

Specific target organ toxicity - single exposure

May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure

Causes damage to organs through prolonged or repeated exposure. - Liver, Kidney

Aspiration hazard

No data available

Additional Information

RTECS: FS9100000

Vomiting, Cough, irritant effects, Shortness of breath, respiratory arrest, narcosis, Dizziness, Nausea, agitation, spasms, inebriation, Headache, Stomach/intestinal disorders, ataxia (impaired locomotor coordination), cardiovascular disorders
Drying-out effect resulting in rough and chapped skin.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Danio rerio (zebra fish) - 121 mg/l - 48 h (OECD Test Guideline 203)
	static test LC50 - Pimephales promelas (fathead minnow) - 103 - 171 mg/l - 96 h Remarks: (ECHA)
	flow-through test LC50 - Oncorhynchus mykiss (rainbow trout) - 18.2 mg/l - 96 h Remarks: (ECHA)
	flow-through test LC50 - Micropterus dolomieu - 51 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 79 mg/l - 48 h Remarks: (ECHA)
Toxicity to algae	static test ErC50 - Chlamydomonas reinhardtii (green algae) - 13.3 mg/l - 72 h Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 14 d

Result: 0 % - Not readily biodegradable.
(OECD Test Guideline 301C)

12.3 Bioaccumulative potential

Bioaccumulation Cyprinus carpio (Carp) - 42 d
at 25 °C - 0.1 mg/l

Bioconcentration factor (BCF): 4.1 - 13
(OECD Test Guideline 305)

Cyprinus carpio (Carp) - 42 d
at 25 °C - 1 mg/l

Bioconcentration factor (BCF): 1.4 - 4.7
(OECD Test Guideline 305)

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1888 Class: 6.1 Packing group: III
Proper shipping name: Chloroform
Reportable Quantity (RQ): 10 lbs Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1888 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: CHLOROFORM

IATA

UN number: 1888 Class: 6.1 Packing group: III
Proper shipping name: Chloroform

15. REGULATORY INFORMATION

SARA 302 Components

	CAS-No.	Revision Date
Chloroform	67-66-3	2008-11-03

SARA 313 Components

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

	CAS-No.	Revision Date
Chloroform	67-66-3	2008-11-03

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Reportable Quantity D022 lbs**Massachusetts Right To Know Components**

Chloroform	CAS-No. 67-66-3	Revision Date 2008-11-03
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Pennsylvania Right To Know Components

Chloroform	CAS-No. 67-66-3	Revision Date 2008-11-03
------------	--------------------	-----------------------------

California Prop. 65 Components

, which is/are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov . Chloroform	CAS-No. 67-66-3	Revision Date 2011-09-01
---	--------------------	-----------------------------

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H331	Toxic if inhaled.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.
H361d	Suspected of damaging the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H402	Harmful to aquatic life.
Repr.	Reproductive toxicity
Skin Irrit.	Skin irritation
STOT RE	Specific target organ toxicity - repeated exposure
STOT SE	Specific target organ toxicity - single exposure

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.18

Revision Date: 08/14/2018

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 6.3
Revision Date 04/05/2019
Print Date 06/28/2019**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Chromium

Product Number : 374849
Brand : Aldrich
CAS-No. : 7440-47-3**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 sheetCompany : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATESTelephone : +1 314 771-5765
Fax : +1 800 325-5052**1.4 Emergency telephone number**

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture**

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none**SECTION 3: Composition/information on ingredients****3.1 Substances**Formula : Cr
Molecular weight : 52.00 g/mol
CAS-No. : 7440-47-3
EC-No. : 231-157-5

Component	Classification	Concentration
-----------	----------------	---------------

Chromium	
	<= 100 %

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice

Move out of dangerous area.

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water.

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

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

5.2 Special hazards arising from the substance or mixture

Chromium oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas.
For personal protection see section 8.

6.2 Environmental precautions

No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): 13: Non Combustible Solids

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

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Chromium	7440-47-3	PEL	0.5 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
	Remarks	see Sections 1532.2, 5206 & 8359		
		TWA	1 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.5 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Skin irritation Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Not classifiable as a human carcinogen varies		

8.2 Exposure controls

Appropriate engineering controls

General industrial hygiene practice.

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).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

No special environmental precautions required.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|--------------------|-----------------------------------|
| a) Appearance | Form: chips
Colour: light grey |
| b) Odour | odourless |
| c) Odour Threshold | No data available |
| d) pH | No data available |

e) Melting point/freezing point	Melting point/range: 1,857 °C (3,375 °F) - lit.
f) Initial boiling point and boiling range	2,672 °C 4,842 °F - lit.
g) Flash point	()Not applicable
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	7.14 g/mL at 25 °C (77 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

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 acids, Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Chromium oxides

Other decomposition products - No data available

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: GB4200000

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

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish LC50 - Cyprinus carpio (Carp) - 14.3 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 0.07 mg/l - 48 h

12.2 Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

Bioaccumulation Oncorhynchus mykiss (rainbow trout) - 30 d
- 50 µg/l(Chromium)

Bioconcentration factor (BCF): 1.03 - 1.22

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

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. ()
Reportable Quantity (RQ): 5000 lbs
Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. ()
Marine pollutant : yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. ()

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

SECTION 15: Regulatory information**SARA 302 Components**

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

SARA 313 Components

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

	CAS-No.	Revision Date
Chromium	7440-47-3	2007-07-01

SARA 311/312 Hazards

Chronic Health Hazard

Reportable Quantity : D007 lbs

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Chromium	7440-47-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Chromium	7440-47-3	2007-07-01

California Prop. 65 Components

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

SECTION 16: Other information**Further information**

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

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Version: 6.3

Revision Date: 04/05/2019

Print Date: 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : CHRYSENE, 98%

Product Number : 245186

Brand : Aldrich

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Germ cell mutagenicity (Category 2), H341

Carcinogenicity (Category 1B), H350

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H341

Suspected of causing genetic defects.

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P273

Avoid release to the environment.

P281

Use personal protective equipment as required.

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P391

Collect spillage.

P405

Store locked up.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none**3. COMPOSITION/INFORMATION ON INGREDIENTS****3.1 Substances**

Formula : C₁₈H₁₂
 Molecular weight : 228.29 g/mol

Hazardous components

Component	Classification	Concentration
Chrysene	Muta. 2; Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H341, H350, H410	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES**4.1 Description of first aid measures****General advice**

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
	Remarks	Cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section), see BEI® for Polycyclic Aromatic Hydrocarbons (PAHs) Exposure by all routes should be carefully controlled to levels as low as possible. Confirmed animal carcinogen with unknown relevance to humans		
Chrysene	218-01-9	TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		1910.1002 As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard OSHA specifically regulated carcinogen		
		TWA	0.100000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products. cyclohexane-extractable fraction See Appendix C		

		See Appendix A		
		PEL	0.2 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
	-	1-Hydroxypyrene		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- a) Appearance Form: solid

	Colour: white, light yellow
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	253.0 °C (487.4 °F)
f) Initial boiling point and boiling range	448.0 °C (838.4 °F)
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	insoluble
o) Partition coefficient: n-octanol/water	log Pow: 5.73
p) Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - > 320 mg/kg

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.

In vitro tests showed mutagenic effects

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Chrysene)

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

OSHA: OSHA specifically regulated carcinogen (Chrysene)

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 1.90 mg/l - 2 h

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Chrysene)
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Chrysene)
Marine pollutant:yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Chrysene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components

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

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.

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	1994-04-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	1994-04-01

	CAS-No.	Revision Date
Chrysene	218-01-9	1994-04-01

New Jersey Right To Know Components

Chrysene

CAS-No.
218-01-9

Revision Date
1994-04-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

Chrysene

CAS-No.
218-01-9

Revision Date
2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

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

NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.10

Revision Date: 01/10/2018

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 3.11
Revision Date 05/23/2016
Print Date 07/17/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Cobalt

Product Number : 697745
Brand : Aldrich

CAS-No. : 7440-48-4

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Respiratory sensitisation (Category 1), H334

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H334

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

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P261

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

P273

Avoid release to the environment.

P285

In case of inadequate ventilation wear respiratory protection.

P304 + P341

IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing.

P342 + P311

If experiencing respiratory symptoms: Call a POISON CENTER/doctor.

P391

Collect spillage.

P501

Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Synonyms : Carbon coated cobalt nanoparticles
magnetic cobalt

Formula : Co
Molecular weight : 58.93 g/mol

Hazardous components

Component	Classification	Concentration
Cobalt		
CAS-No. 7440-48-4	Resp. Sens. 1; Skin Sens. 1; Aquatic Chronic 4; H317, H334, H413	<= 100 %
EC-No. 231-158-0		
Index-No. 027-001-00-9		
Graphene-like carbon		
	Eye Irrit. 2A; STOT SE 3; H319, H335	>= 5 - < 10 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

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

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Heat sensitive. Keep in a dry place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Cobalt	7440-48-4	TWA	0.100000 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.020000 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Pulmonary function Asthma Myocardial effects Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		

		TWA	0.050000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.100000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.050000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.050000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.050000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.020000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Pulmonary function Asthma Myocardial effects Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans varies		
		TWA	0.05 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.05 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.02 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Pulmonary function Asthma Myocardial effects Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans varies		
		PEL	0.02 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Cobalt	7440-48-4	Cobalt	15.0000 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		Cobalt	1.0000 µg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			
		Cobalt	15 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			
		Cobalt		Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Body Protection

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

Respiratory protection

For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|----------------------------|
| a) Appearance | Form: powder |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | No data available |
| f) Initial boiling point and boiling range | 2,900 °C (5,252 °F) - lit. |
| g) Flash point | Not applicable |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | 8.9 g/mL at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition 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

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

Oxidizing agents, Strong oxidizing agents, Acetylene, Material readily reacts with acids generating flammable and/or explosive hydrogen gas., Mineral acids, Hydrazinium nitrate

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Cobalt/cobalt oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Cobalt)

2A - Group 2A: Probably carcinogenic to humans (Cobalt)

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Cobalt)

2A - Group 2A: Probably carcinogenic to humans (Cobalt)

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

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

carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available
No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

Kidney injury may occur., Damage to the eyes., Lung irritation, chest pain, pulmonary edema, May cause irritation of the:, nose, Throat., sensation of heat

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3089 Class: 4.1 Packing group: II
Proper shipping name: Metal powders, flammable, n.o.s.

Poison Inhalation Hazard: No

IMDG

UN number: 3089 Class: 4.1 Packing group: II EMS-No: F-G, S-G
Proper shipping name: METAL POWDER, FLAMMABLE, N.O.S.

IATA

UN number: 3089 Class: 4.1 Packing group: II
Proper shipping name: Metal powder, flammable, n.o.s.

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Cobalt	7440-48-4	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Cobalt	7440-48-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Cobalt	7440-48-4	2007-07-01
Graphene-like carbon	-	

New Jersey Right To Know Components

	CAS-No.	Revision Date
Cobalt	7440-48-4	2007-07-01
Graphene-like carbon	-	

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Cobalt	7440-48-4	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Chronic	Chronic aquatic toxicity
Eye Irrit.	Eye irritation
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H335	May cause respiratory irritation.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
H413	May cause long lasting harmful effects to aquatic life.
Resp. Sens.	Respiratory sensitisation
Skin Sens.	Skin sensitisation

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	3

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	3

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.11

Revision Date: 05/23/2016

Print Date: 07/17/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 03/12/2019
Print Date 06/22/2019

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Copper

Product Number : 31284
Brand : Aldrich
CAS-No. : 7440-50-8

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula : Cu
Molecular weight : 63.55 g/mol
CAS-No. : 7440-50-8
EC-No. : 231-159-6

Component	Classification	Concentration
-----------	----------------	---------------

Copper,		
		<= 100 %

SECTION 4: First aid measures

4.1 Description of first aid measures

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water.

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

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

5.2 Special hazards arising from the substance or mixture

Copper oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas.
For personal protection see section 8.

6.2 Environmental precautions

No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Store under inert gas. Air sensitive.

Storage class (TRGS 510): 13: Non Combustible Solids

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

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Copper,	7440-50-8	TWA	1 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Irritation Gastrointestinal metal fume fever		
		TWA	0.2 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Irritation Gastrointestinal metal fume fever		

		TWA	1 mg/m ³	USA. NIOSH Recommended Exposure Limits
		TWA	1 mg/m ³	USA. NIOSH Recommended Exposure Limits
		TWA	1 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.1 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	0.1 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

General industrial hygiene practice.

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).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

No special environmental precautions required.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: Wire Colour: light red
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 1,083.4 °C (1,982.1 °F)
f) Initial boiling point and boiling range	2,567 °C 4,653 °F
g) Flash point	()No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	8.940 g/cm ³
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

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 acids, Strong oxidizing agents, Acid chlorides, Halogens

10.6 Hazardous decomposition products

Other decomposition products - No data available

Hazardous decomposition products formed under fire conditions. - Copper oxides

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - 3.5 mg/kg

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: GL5325000

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

SECTION 12: Ecological information**12.1 Toxicity**

No data available

12.2 Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

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

SECTION 13: Disposal considerations**13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information**DOT (US)**

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

SECTION 15: Regulatory information**SARA 302 Components**

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

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.

Pennsylvania Right To Know Components

Copper,	CAS-No. 7440-50-8	Revision Date 1993-02-16
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Copper,	CAS-No. 7440-50-8	Revision Date 1993-02-16
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New Jersey Right To Know Components

Copper,	CAS-No. 7440-50-8	Revision Date 1993-02-16
---------	----------------------	-----------------------------

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

SECTION 16: Other information**Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.1

Revision Date: 03/12/2019

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 05/14/2019
Print Date 07/17/2019

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Cyanide, Total

Product Number : QC1496
Brand : Sigma-Aldrich

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.2 Mixtures

No components need to be disclosed according to the applicable regulations.

SECTION 4: First aid measures

4.1 Description of first aid measures

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact

Wash off with soap and plenty of water.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water.

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

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Nature of decomposition products not known.

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Avoid breathing vapours, mist or gas.
For personal protection see section 8.

6.2 Environmental precautions

No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up

Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Store at Room Temperature.

Storage class (TRGS 510): 12: Non Combustible Liquids

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

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

General industrial hygiene practice.

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).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection

Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Respiratory protection not required. For nuisance exposures use type OV/AG (US) or type ABEK (EU EN 14387) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

No special environmental precautions required.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|---------------|-------------------|
| a) Appearance | Form: liquid |
| b) Odour | No data available |

c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	No data available
f) Initial boiling point and boiling range	No data available
g) Flash point	()No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

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

Other decomposition products - No data available

Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

SECTION 15: Regulatory information

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Water	7732-18-5	
Tripotassium hexacyanoferrate	13746-66-2	2015-07-08
Potassium hydroxide	1310-58-3	1989-08-11

New Jersey Right To Know Components

	CAS-No.	Revision Date
Water	7732-18-5	

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Tripotassium hexacyanoferrate	13746-66-2	2016-10-21

SECTION 16: Other information

Further information

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Version: 6.0

Revision Date: 05/14/2019

Print Date: 07/17/2019

SAFETY DATA SHEET

Version 5.6
Revision Date 09/23/2016
Print Date 07/17/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : δ -BHC
Product Number : 40103-U
Brand : Supelco

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 2), H225
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 3), H331
Acute toxicity, Dermal (Category 3), H311
Carcinogenicity (Category 2), H351
Specific target organ toxicity - single exposure (Category 1), H370
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H225 Highly flammable liquid and vapour.
H301 + H311 + H331 Toxic if swallowed, in contact with skin or if inhaled
H351 Suspected of causing cancer.
H370 Causes damage to organs.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P201 Obtain special instructions before use.

P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P307 + P311	IF exposed: Call a POISON CENTER or doctor/ physician.
P322	Specific measures (see supplemental first aid instructions on this label).
P330	Rinse mouth.
P361	Remove/Take off immediately all contaminated clothing.
P363	Wash contaminated clothing before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Formula	: C ₆ H ₆ Cl ₆
Molecular weight	: 290.83 g/mol

Hazardous components

Component	Classification	Concentration
Methanol		
CAS-No.	67-56-1	Flam. Liq. 2; Acute Tox. 3; STOT SE 1; H225, H301 + H311 + H331, H370
EC-No.	200-659-6	
Index-No.	603-001-00-X	
Registration number	01-2119433307-44-XXXX	
1α,2α,3α,4β,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane		
CAS-No.	319-86-8	Acute Tox. 3; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H312, H351, H410
EC-No.	206-272-9	
Index-No.	602-042-00-0	
		>= 0.1 - < 1 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas. For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist. Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Recommended storage temperature 2 - 8 °C

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Methanol	67-56-1	TWA	200.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Headache Nausea Dizziness Eye damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Danger of cutaneous absorption		
		STEL	250.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Headache Nausea Dizziness Eye damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Danger of cutaneous absorption		
		TWA	200.000000 ppm 260.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		ST	250.000000 ppm 325.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		TWA	200.000000 ppm 260.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Headache Nausea Dizziness Eye damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Danger of cutaneous absorption		
		STEL	250 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Headache Nausea Dizziness Eye damage Substances for which there is a Biological Exposure Index or Indices		

		(see BEI® section) Danger of cutaneous absorption		
		TWA	200 ppm 260 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		ST	250 ppm 325 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		TWA	200 ppm 260 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		STEL	250 ppm 325 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		
		TWA	200 ppm 260 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		
		C	1,000 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		PEL	200 ppm 260 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		STEL	250 ppm 325 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Methanol	67-56-1	Methanol	15.0000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			
		Methanol	15 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 480 min
Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 30 min
Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|----------------------------|
| a) Appearance | Form: liquid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | No data available |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | 11 °C (52 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | No data available |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition 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

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

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials

acids, Acid chlorides, Acid anhydrides, Oxidizing agents, Alkali metals

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: 2B - Group 2B: Possibly carcinogenic to humans (1 α ,2 α ,3 α ,4 β ,5 α ,6 β)-1,2,3,4,5,6-Hexachlorocyclohexane)

IARC: 2B - Group 2B: Possibly carcinogenic to humans (1 α ,2 α ,3 α ,4 β ,5 α ,6 β)-1,2,3,4,5,6-Hexachlorocyclohexane)

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a

carcinogen or potential carcinogen by ACGIH.

NTP: Reasonably anticipated to be a human carcinogen (1 α ,2 α ,3 α ,4 β ,5 α ,6 β)-1,2,3,4,5,6-Hexachlorocyclohexane)

NTP: Reasonably anticipated to be a human carcinogen (1 α ,2 α ,3 α ,4 β ,5 α ,6 β)-1,2,3,4,5,6-Hexachlorocyclohexane)

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

Methyl alcohol may be fatal or cause blindness if swallowed., Cannot be made non-poisonous., Effects due to ingestion may include:, Nausea, Headache, Vomiting, Gastrointestinal disturbance, Dizziness, Weakness, Confusion., Drowsiness, Unconsciousness, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Central nervous system - Breathing difficulties - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

Central nervous system - (1 α ,2 α ,3 α ,4 β ,5 α ,6 β)-1,2,3,4,5,6-Hexachlorocyclohexane)

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Harmful to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 1230 Class: 3 Packing group: II
 Proper shipping name: Methanol, solution
 Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1230 Class: 3 (6.1) Packing group: II EMS-No: F-E, S-D
 Proper shipping name: METHANOL, SOLUTION

IATA

UN number: 1230 Class: 3 (6.1) Packing group: II
 Proper shipping name: Methanol, solution

15. REGULATORY INFORMATION**SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01
1 α ,2 α ,3 α ,4 β ,5 α ,6 β)-1,2,3,4,5,6-Hexachlorocyclohexane	319-86-8	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01
1 α ,2 α ,3 α ,4 β ,5 α ,6 β)-1,2,3,4,5,6-Hexachlorocyclohexane	319-86-8	1993-04-24

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
1 α ,2 α ,3 α ,4 β ,5 α ,6 β)-1,2,3,4,5,6-Hexachlorocyclohexane	319-86-8	2015-08-14

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

	CAS-No.	Revision Date
Methanol	67-56-1	2012-03-16

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
1 α ,2 α ,3 α ,4 β ,5 α ,6 β)-1,2,3,4,5,6-Hexachlorocyclohexane	319-86-8	2015-08-14

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive

	CAS-No.	Revision Date
	67-56-1	2012-03-16

harm.
Methanol

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H301	Toxic if swallowed.
H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled
H311	Toxic in contact with skin.
H312	Harmful in contact with skin.
H331	Toxic if inhaled.
H351	Suspected of causing cancer.
H370	Causes damage to organs.
H402	Harmful to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
H412	Harmful to aquatic life with long lasting effects.
STOT SE	Specific target organ toxicity - single exposure

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0
Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.6

Revision Date: 09/23/2016

Print Date: 07/17/2019

SIGMA-ALDRICH

MATERIAL SAFETY DATA SHEET

Date Printed: 20.10.2018

Date Updated: 07.05.2009

Version 1.4

Section 1 - Product and Company Information

Product Name 1,2:5,6-DIBENZANTHRACENE, 97% (NO BULK
ORDERS ALLOWED)
Product Number D31400
Brand ALDRICH

Company Sigma-Aldrich
Address 3050 Spruce Street
SAINT LOUIS MO 63103 US

Technical Phone: 800-325-5832
Fax: 800-325-5052
Emergency Phone: 314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
1,2:5,6-DIBENZANTHRACENE	53-70-3	Yes

Formula C22H14
Synonyms 1,2:5,6-Benzanthracene * DB(a,h)A * 1,2,5,6-DbA *
1,2,5,6-Dibenzanthracene (Dutch) *
1,2:5,6-Dibenzanthracene *
1,2:5,6-Dibenz(a)anthracene *
Dibenzo(a,h)anthracene *
1,2:5,6-Dibenzoanthracene * RCRA waste number U063
RTECS Number: HN2625000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Toxic. Dangerous for the environment.
May cause cancer. Very toxic to aquatic organisms, may cause
long-term adverse effects in the aquatic environment.
Target organ(s): Lungs. Liver. Calif. Prop. 65 carcinogen.

HMIS RATING

HEALTH: 2*
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING

HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE

If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

DERMAL EXPOSURE

In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT

N/A

AUTOIGNITION TEMP

N/A

FLAMMABILITY

N/A

EXTINGUISHING MEDIA

Suitable: Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING

Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL

Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)

Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves. Wear disposable coveralls and discard them after use.

METHODS FOR CLEANING UP

Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING

User Exposure: Do not breathe dust. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE

Suitable: Keep tightly closed.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS

Use only in a chemical fume hood. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.

Hand: Compatible chemical-resistant gloves.

Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES

Wash contaminated clothing before reuse. Wash thoroughly after handling.

EXPOSURE LIMITS

Country	Source	Type	Value
Poland		NDS	0.004 MG/M3
Poland		NDSch	-
Poland		NDSP	-

Section 9 - Physical/Chemical Properties

Appearance Physical State: Solid

Property	Value	At Temperature or Pressure
Molecular Weight	278,3500 AMU	
pH	N/A	
BP/BP Range	524,000 °C	760,000 mmHg
MP/MP Range	262,000 °C	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	

Solubility N/A

N/A = not available

Section 10 - Stability and Reactivity

STABILITY

Stable: Stable.

Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION

Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE

Skin Contact: May cause skin irritation.

Skin Absorption: May be harmful if absorbed through the skin.

Eye Contact: May cause eye irritation.

Inhalation: Material may be irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.

Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)

Lungs. Liver.

SIGNS AND SYMPTOMS OF EXPOSURE

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

CHRONIC EXPOSURE - CARCINOGEN

Result: This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Species: Rat

Route of Application: Intratracheal

Dose: 100 MG/KG

Result: Tumorigenic: Carcinogenic by RTECS criteria. Lungs, Thorax, or Respiration: Tumors.

Species: Mouse

Route of Application: Oral

Dose: 4160 MG/KG

Exposure Time: 26W

Frequency: I

Result: Lungs, Thorax, or Respiration: Tumors.

Tumorigenic: Carcinogenic by RTECS criteria.

Species: Mouse

Route of Application: Skin

Dose: 1200 MG/KG

Exposure Time: 50W

Frequency: I

Result: Tumorigenic: Tumors at site or application.

Tumorigenic: Carcinogenic by RTECS criteria. Skin and Appendages:

Other: Tumors.

Species: Mouse
Route of Application: Subcutaneous
Dose: 445 UG/KG
Result: Skin and Appendages: Other: Tumors.
Tumorigenic: Carcinogenic by RTECS criteria. Tumorigenic: Tumors
at site or application.

Species: Mouse
Route of Application: Intravenous
Dose: 40 MG/KG
Result: Tumorigenic: Neoplastic by RTECS criteria. Lungs, Thorax,
or Respiration: Tumors. Liver: Tumors.

Species: Mouse
Route of Application: Implant
Dose: 80 MG/KG
Result: Kidney, Ureter, Bladder: Tumors. Tumorigenic: Carcinogenic
by RTECS criteria.

Species: Mouse
Route of Application: Multiple
Dose: 40 MG/KG
Exposure Time: 12D
Frequency: I
Result: Tumorigenic: Tumors at site or application. Lungs,
Thorax, or Respiration: Tumors. Tumorigenic: Equivocal tumorigenic
agent by RTECS criteria.

Species: Guinea pig
Route of Application: Subcutaneous
Dose: 250 MG/KG
Exposure Time: 24D
Frequency: I
Result: Tumorigenic: Equivocal tumorigenic agent by RTECS
criteria. Tumorigenic: Tumors at site or application. Lungs,
Thorax, or Respiration: Tumors.

Species: Guinea pig
Route of Application: Intravenous
Dose: 30 MG/KG
Result: Tumorigenic: Tumors at site or application. Lungs,
Thorax, or Respiration: Tumors. Tumorigenic: Equivocal tumorigenic
agent by RTECS criteria.

Species: Pigeon
Route of Application: Intramuscular
Dose: 6 MG/KG
Result: Tumorigenic: Carcinogenic by RTECS criteria.
Liver: Tumors. Tumorigenic: Tumors at site or application.

Species: Frog
Route of Application: Intrarenal
Dose: 12 MG/KG
Result: Kidney, Ureter, Bladder: Kidney tumors. Lungs, Thorax, or
Respiration: Tumors. Tumorigenic: Neoplastic by RTECS criteria.

Species: Mouse
Route of Application: Implant
Dose: 14 MG/KG

Result: Tumorigenic:Neoplastic by RTECS criteria.
Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Subcutaneous
Dose: 78 UG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria.
Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Oral
Dose: 4520 MG/KG
Exposure Time: 36W
Frequency: C
Result: Tumorigenic:Carcinogenic by RTECS criteria. Lungs,
Thorax, or Respiration:Tumors. Gastrointestinal:Tumors.

Species: Mouse
Route of Application: Implant
Dose: 200 MG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax,
or Respiration:Bronchiogenic carcinoma. Tumorigenic:Tumors at
site or application.

Species: Mouse
Route of Application: Skin
Dose: 6 UG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria. Skin and
Appendages: Other: Tumors.

Species: Mouse
Route of Application: Subcutaneous
Dose: 6 MG/KG
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS
criteria. Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Skin
Dose: 400 MG/KG
Exposure Time: 40W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Skin and
Appendages: Other: Tumors.

Species: Mouse
Route of Application: Implant
Dose: 100 MG/KG
Result: Tumorigenic:Carcinogenic by RTECS criteria. Kidney,
Ureter, Bladder:Tumors. Tumorigenic:Tumors at site or
application.

Species: Rat
Route of Application: Subcutaneous
Dose: 135 MG/KG
Exposure Time: 9W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax,
or Respiration:Tumors. Tumorigenic:Tumors at site or application.

Species: Mouse

Route of Application: Subcutaneous
Dose: 400 MG/KG
Exposure Time: 10W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria.
Tumorigenic:Tumors at site or application.

IARC CARCINOGEN LIST

Rating: Group 2A

NTP CARCINOGEN LIST

Rating: Anticipated to be a carcinogen.

CHRONIC EXPOSURE - MUTAGEN

Result: Laboratory experiments have shown mutagenic effects.

Species: Human
Dose: 360 NMOL/L
Cell Type: Embryo
Mutation test: DNA

Species: Human
Dose: 100 UMOL/L
Cell Type: fibroblast
Mutation test: Unscheduled DNA synthesis

Species: Human
Dose: 10 MG/L
Cell Type: Other cell types
Mutation test: Unscheduled DNA synthesis

Species: Human
Dose: 100 NMOL/L
Cell Type: HeLa cell
Mutation test: Unscheduled DNA synthesis

Species: Human
Dose: 54 UG/L
Cell Type: lymphocyte
Mutation test: Mutation in mammalian somatic cells.

Species: Rat
Route: Intratracheal
Dose: 25500 UG/KG
Exposure Time: 16H
Mutation test: Micronucleus test

Species: Rat
Route: Oral
Dose: 200 MG/KG
Mutation test: Morphological transformation.

Species: Rat
Dose: 100 UG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Rat

Route: Intratracheal
Dose: 25560 UG/KG
Mutation test: DNA

Species: Rat
Route: Intratracheal
Dose: 51150 UG/KG
Mutation test: Sister chromatid exchange

Species: Mouse
Route: Intraperitoneal
Dose: 500 MG/KG
Mutation test: Micronucleus test

Species: Mouse
Dose: 4250 UG/L (+S9)
Cell Type: lymphocyte
Mutation test: Mutation in microorganisms

Species: Mouse
Dose: 500 UG/L
Cell Type: fibroblast
Mutation test: Morphological transformation.

Species: Mouse
Dose: 100 UG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Mouse
Dose: 6 UMOL/L
Cell Type: liver
Mutation test: DNA

Species: Mouse
Route: Skin
Dose: 40 UMOL/KG
Mutation test: DNA

Species: Mouse
Dose: 1 MG/L
Cell Type: Other cell types
Mutation test: DNA

Species: Mouse
Dose: 1 MG/L
Cell Type: Other cell types
Mutation test: Other mutation test systems

Species: Mouse
Dose: 510 NMOL/L
Cell Type: Embryo
Mutation test: DNA

Species: Mouse
Dose: 510 NMOL/L
Cell Type: Embryo
Mutation test: Other mutation test systems

Species: Hamster

Dose: 56400 NMOL/L (+S9)
Cell Type: lung
Mutation test: Mutation in microorganisms

Species: Hamster
Dose: 2500 UG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Hamster
Dose: 25 UG/L
Cell Type: kidney
Mutation test: Morphological transformation.

Species: Hamster
Dose: 5 MG/L
Exposure Time: 24H
Cell Type: fibroblast
Mutation test: DNA damage

Species: Hamster
Dose: 360 NMOL/L
Cell Type: Embryo
Mutation test: DNA

Species: Hamster
Dose: 5 MG/L
Cell Type: kidney
Mutation test: DNA damage

Species: Hamster
Dose: 1 MG/L
Cell Type: lung
Mutation test: DNA

Species: Hamster
Dose: 1 MG/L
Cell Type: lung
Mutation test: Other mutation test systems

Species: Hamster
Dose: 1 MMOL/L
Cell Type: fibroblast
Mutation test: Cytogenetic analysis

Species: Hamster
Route: Intraperitoneal
Dose: 900 MG/KG
Exposure Time: 24H
Mutation test: Sister chromatid exchange

Species: Hamster
Dose: 500 UG/L
Cell Type: lung
Mutation test: Mutation in mammalian somatic cells.

Species: Mammal
Dose: 2 NMOL/L
Cell Type: lymphocyte
Mutation test: DNA damage

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION

Contact a licensed professional waste disposal service to dispose of this material. Observe all federal, state, and local environmental regulations. (DN)Requires special label: "Contains a substance which is regulated by Danish work environmental law due to the risk of carcinogenic properties."

Section 14 - Transport Information

DOT

Proper Shipping Name: Environmentally hazardous substances, solid, n.o.s.
UN#: 3077
Class: 9
Packing Group: Packing Group III
Hazard Label: Class 9
PIH: Not PIH

IATA

Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s.
IATA UN Number: 3077
Hazard Class: 9
Packing Group: III

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION

Symbol of Danger: T-N
Indication of Danger: Toxic. Dangerous for the environment.
R: 45-50/53
Risk Statements: May cause cancer. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S: 53-45-60-61
Safety Statements: Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT

Indication of Danger: Toxic. Dangerous for the environment.
Risk Statements: May cause cancer. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Statements: Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Wear suitable protective clothing, gloves, and eye/face protection. This

material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

US Statements: Target organ(s): Lungs. Liver. Calif. Prop. 65 carcinogen.

UNITED STATES REGULATORY INFORMATION

SARA LISTED: Yes

NOTES: This product is subject to SARA section 313 reporting requirements.

TSCA INVENTORY ITEM: Yes

UNITED STATES - STATE REGULATORY INFORMATION

CALIFORNIA PROP - 65

California Prop - 65: This product is or contains chemical(s) known to the state of California to cause cancer. This product is or contains chemical(s) known to the state of California to cause cancer.

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.

DSL: No

NDSL: Yes

Section 16 - Other Information

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2010 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.

SAFETY DATA SHEET

Version 6.0
Revision Date 04/15/2019
Print Date 06/28/2019

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Dibenzofuran
Product Number : 236373
Brand : Aldrich
CAS-No. : 132-64-9

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 Street
ST. LOUIS MO 63103
UNITED STATES
Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms : Diphenylene oxide
Formula : C₁₂H₈O
Molecular weight : 168.19 g/mol
CAS-No. : 132-64-9

EC-No. : 205-071-3

No components need to be disclosed according to the applicable regulations.

SECTION 4: First aid measures

4.1 Description of first aid measures

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact

Wash off with soap and plenty of water.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water.

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

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas.

For personal protection see section 8.

6.2 Environmental precautions

No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): 13: Non Combustible Solids

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

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

General industrial hygiene practice.

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).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This

recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

No special environmental precautions required.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: powder, finecrystalline Colour: white, beige
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 80 - 82 °C (176 - 180 °F) - lit.
f) Initial boiling point and boiling range	154 - 155 °C 309 - 311 °F at 27 hPa - lit.
g) Flash point	130 °C (266 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	1.3 g/cm ³ at 20 °C (68 °F)
n) Water solubility	insoluble
o) Partition coefficient: n-octanol/water	log Pow: 4.12 - (Lit.), Potential bioaccumulation
p) Auto-ignition temperature	No data available
q) Decomposition	No data available

temperature

- 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Hazardous properties cannot be excluded.

Handle in accordance with good industrial hygiene and safety practice.

SECTION 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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Dibenzofuran)
Reportable Quantity (RQ): 100 lbs
• Marine pollutant: yes Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
(Dibenzofuran)
Marine pollutant : yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Dibenzofuran)

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPO.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Dibenzofuran	132-64-9	2007-07-01

SARA 311/312 Hazards

No SARA Hazards

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Dibenzofuran	132-64-9	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Dibenzofuran	132-64-9	2007-07-01

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

SECTION 16: Other information

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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: 6.0

Revision Date: 04/15/2019

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 03/14/2018
Print Date 07/17/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Dieldrin

Product Number : 33491
Brand : Sigma-Aldrich
Index-No. : 602-049-00-9

CAS-No. : 60-57-1

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

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 2), H300

Acute toxicity, Dermal (Category 1), H310

Carcinogenicity (Category 2), H351

Specific target organ toxicity - repeated exposure, Oral (Category 1), H372

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word	Danger
Hazard statement(s)	
H300 + H310	Fatal if swallowed or in contact with skin
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if swallowed.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P262	Do not get in eyes, on skin, or on clothing.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P350 + P310	IF ON SKIN: Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor/ physician.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: 1,2,3,4,10,10-Hexachloro-1,4,4a,5,6,7,8,8a-octahydro-6,7-epoxy-1,4:5,8-dimethanonaphthalene
Formula	: C ₁₂ H ₈ Cl ₆ O
Molecular weight	: 380.91 g/mol
CAS-No.	: 60-57-1
EC-No.	: 200-484-5
Index-No.	: 602-049-00-9

Hazardous components

Component	Classification	Concentration
Dieldrin	Acute Tox. 2; Acute Tox. 1; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H300 + H310, H351, H372, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Storage class (TRGS 510): 6.1B: Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Dieldrin	60-57-1	TWA	0.100000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Liver damage Reproductive effects Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.250000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A Potential for dermal absorption		
		TWA	0.250000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Liver damage Reproductive effects Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.25 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A Potential for dermal absorption		
		TWA	0.25 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.25 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		
		PEL	0.25 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: solid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 143 - 144 °C (289 - 291 °F) - lit. |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | No data available |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 38.3 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Ingestion - Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard

No data available

Additional Information

RTECS: IO1750000

Discomfort, Headache, Nausea, Vomiting, Dizziness, Tremors, tonic convulsions, clonic spasms, Coma., respiratory failure, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Blood - Irregularities - Based on Human Evidence

Blood - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish mortality LC50 - Carassius auratus (goldfish) - 1.6 µg/l - 96.0 h(Dieldrin)

Toxicity to daphnia and Immobilization EC50 - Daphnia magna (Water flea) - 79.5 µg/l - 48 h(Dieldrin)
other aquatic
invertebrates**12.2 Persistence and degradability**

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(Dieldrin)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 2811 Class: 6.1 Packing group: I

Proper shipping name: Toxic solids, organic, n.o.s. (Dieldrin)

Reportable Quantity (RQ) : 1 lbs

Marine pollutant: no no
Poison Inhalation Hazard: No

IMDG

UN number: 2811 Class: 6.1 Packing group: I EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Dieldrin)
Marine pollutant : yes

IATA

UN number: 2811 Class: 6.1 Packing group: I
Proper shipping name: Toxic solid, organic, n.o.s. (Dieldrin)
IATA Passenger: Not permitted for transport
A5

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Dieldrin	60-57-1	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Dieldrin	60-57-1	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Dieldrin	60-57-1	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Dieldrin	60-57-1	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H300	Fatal if swallowed.
H300 + H310	Fatal if swallowed or in contact with skin
H310	Fatal in contact with skin.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if swallowed.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	4
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard: 4
Fire Hazard: 0
Reactivity Hazard: 0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 03/14/2018

Print Date: 07/17/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Endosulfan sulfate

Product Number : 36676

Brand : Sigma

CAS-No. : 1031-07-8

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 2), H300

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H300

Fatal if swallowed.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P264

Wash skin thoroughly after handling.

P270

Do not eat, drink or smoke when using this product.

P273

Avoid release to the environment.

P301 + P310

IF SWALLOWED: Immediately call a POISON CENTER/doctor.

P321

Specific treatment (see supplemental first aid instructions on this label).

P330

Rinse mouth.

P391

Collect spillage.

P405

Store locked up.

P501

Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula : $C_9H_6Cl_6O_4S$
Molecular weight : 422.92 g/mol
CAS-No. : 1031-07-8

Hazardous components

Component	Classification	Concentration
Endosulfan sulfate	Acute Tox. 2; Aquatic Acute 1; Aquatic Chronic 1; H300, H410	-

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): 6.1B: Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|-------------------------------------|
| a) Appearance | Form: solid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | 179.0 - 182.0 °C (354.2 - 359.6 °F) |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | No data available |
| n) Water solubility | insoluble |
| o) Partition coefficient: n-octanol/water | log Pow: 3.66 |
| p) Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Sulphur oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 18.0 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: RB9150000

Cholinesterase inhibitors can cause heavy salivation and secretion in the lungs, lachrymation, blurred vision, involuntary defecation, diarrhea, tremor, ataxia, sweating, hypothermia, lowered heart rate, and/or a fall in blood pressure as a result of their action at cholinergic nerve sites., Headache, Nausea, Vomiting, Dizziness, Drowsiness, Confusion., Weakness, Muscle cramps/spasms., Change in pupil size., Fever, Seizures., Incoordination., Convulsions, Coma.

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish	LC50 - Carassius auratus (goldfish) - > 0.01 - < 0.1 mg/l - 48.0 h
	LC50 - Leuciscus idus (Golden orfe) - > 0.01 - < 0.1 mg/l - 48.0 h
	LC50 - other fish - > 0.001 - < 0.01 mg/l - 48.0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 0.76 mg/l - 48 h
	LC50 - Daphnia magna (Water flea) - > 0.1 - < 1 mg/l - 48 h

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 2811 Class: 6.1 Packing group: II
Proper shipping name: Toxic solids, organic, n.o.s. (Endosulfan sulfate)
Reportable Quantity (RQ): 1 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 2811 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Endosulfan sulfate)

IATA

UN number: 2811 Class: 6.1 Packing group: II
Proper shipping name: Toxic solid, organic, n.o.s. (Endosulfan sulfate)

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Endosulfan sulfate	1031-07-8	1993-04-24

	CAS-No.	Revision Date
Endosulfan sulfate	1031-07-8	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Endosulfan sulfate	1031-07-8	1993-04-24

	CAS-No.	Revision Date
Endosulfan sulfate	1031-07-8	1993-04-24

	CAS-No.	Revision Date
Endosulfan sulfate	1031-07-8	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Endosulfan sulfate	1031-07-8	1993-04-24

	CAS-No.	Revision Date
Endosulfan sulfate	1031-07-8	1993-04-24

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H300	Fatal if swallowed.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard: 3
Fire Hazard: 0
Reactivity Hazard: 0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.2

Revision Date: 02/02/2018

Print Date: 07/17/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 03/14/2018
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Endrin
Product Number : 32014
Brand : Sigma-Aldrich
Index-No. : 602-051-00-X
CAS-No. : 72-20-8

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 Street
ST. LOUIS MO 63103
UNITED STATES
Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

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 1), H300

Acute toxicity, Dermal (Category 2), H310

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)
H300 + H310
H410

Fatal if swallowed or in contact with skin
Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)	
P262	Do not get in eyes, on skin, or on clothing.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P350 + P310	IF ON SKIN: Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor/ physician.
P361	Remove/Take off immediately all contaminated clothing.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₁₂ H ₈ Cl ₆ O
Molecular weight	: 380.91 g/mol
CAS-No.	: 72-20-8
EC-No.	: 200-775-7
Index-No.	: 602-051-00-X

Hazardous components

Component	Classification	Concentration
Endrin	Acute Tox. 1; Acute Tox. 2; Aquatic Acute 1; Aquatic Chronic 1; H300 + H310, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.

Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): 6.1B: Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Endrin	72-20-8	TWA	0.100000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Headache Liver damage Not classifiable as a human carcinogen Danger of cutaneous absorption		

		TWA	0.100000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		TWA	0.100000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		PEL	0.1 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---------------|-----------------------------------|
| a) Appearance | Form: solid
Colour: colourless |
| b) Odour | No data available |

c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	No data available
f) Initial boiling point and boiling range	No data available
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	insoluble
o) Partition coefficient: n-octanol/water	log Pow: 5.20
p) Auto-ignition temperature	No data available
q) Decomposition temperature	226.0 °C (438.8 °F) -
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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 3.0 mg/kg

Inhalation: No data available

LD50 Dermal - Rabbit - 60.0 mg/kg

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: IO1575000

Central nervous system -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - Oncorhynchus mykiss (rainbow trout) - < 0.001 mg/l - 96.0 h(Endrin)

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia pulex (Water flea) - 0.02 mg/l - 48 h(Endrin)

Immobilization EC50 - Daphnia magna (Water flea) - 0.0042 mg/l - 48 h(Endrin)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Bioaccumulation Pimephales promelas (fathead minnow) - 56 d
- 0.63 mg/l(Endrin)

Bioconcentration factor (BCF): 13,000

12.4 Mobility in soil

No data available(Endrin)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2811 Class: 6.1 Packing group: I
Proper shipping name: Toxic solids, organic, n.o.s. (Endrin)
Reportable Quantity (RQ) : 1 lbs

noMarine pollutant: no
Poison Inhalation Hazard: No

IMDG

UN number: 2811 Class: 6.1 Packing group: I EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Endrin)
Marine pollutant : yes

IATA

UN number: 2811 Class: 6.1 Packing group: I
Proper shipping name: Toxic solid, organic, n.o.s. (Endrin)

15. REGULATORY INFORMATION

SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Endrin	72-20-8	2007-07-01

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

Acute Health Hazard

Massachusetts Right To Know Components

CAS-No.	Revision Date
---------	---------------

Endrin 72-20-8 2007-07-01

Pennsylvania Right To Know Components

Endrin CAS-No. 72-20-8 Revision Date 2007-07-01

New Jersey Right To Know Components

Endrin CAS-No. 72-20-8 Revision Date 2007-07-01

California Prop. 65 Components

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.
Endrin CAS-No. 72-20-8 Revision Date 2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H300 Fatal if swallowed.
H300 + H310 Fatal if swallowed or in contact with skin
H310 Fatal in contact with skin.
H400 Very toxic to aquatic life.
H410 Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard: 4
Chronic Health Hazard:
Flammability: 0
Physical Hazard 0

NFPA Rating

Health hazard: 3
Fire Hazard: 0
Reactivity Hazard: 0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 03/14/2018

Print Date: 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Fluoranthene

Product Number : 423947

Brand : Aldrich

CAS-No. : 206-44-0

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H302

Harmful if swallowed.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P264

Wash skin thoroughly after handling.

P270

Do not eat, drink or smoke when using this product.

P273

Avoid release to the environment.

P301 + P312

IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.

P330

Rinse mouth.

P391

Collect spillage.

P501

Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Benzo[j,k]fluorene
Formula	:	C ₁₆ H ₁₀
Molecular weight	:	202.25 g/mol
CAS-No.	:	206-44-0
EC-No.	:	205-912-4

Hazardous components

Component	Classification	Concentration
Fluoranthene	Acute Tox. 4; Aquatic Acute 1; Aquatic Chronic 1; H302, H410	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Fluoranthene	206-44-0	PEL	0.2 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
	-	1-Hydroxypyrene	2.5 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		3-hydroxybenzo(a)pyrene		Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: solid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 105 - 110 °C (221 - 230 °F) - lit. |
| f) Initial boiling point and boiling range | 384 °C (723 °F) - lit. |
| g) Flash point | 198.0 °C (388.4 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |

- | | |
|---|-------------------|
| l) Vapour density | No data available |
| m) Relative density | No data available |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 2,000 mg/kg

Inhalation: No data available

LD50 Dermal - Rabbit - 3,180 mg/kg

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

- IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
- NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
- OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: LL4025000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.0077 mg/l - 96 h NOEC - Cyprinodon variegatus (sheepshead minnow) - 560 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - > 0.005 - < 0.01 mg/l - 3 d Immobilization EC50 - Daphnia magna (Water flea) - 0.78 mg/l - 20 h NOEC - Daphnia magna (Water flea) - 0.085 mg/l - 48 h

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life with long lasting effects.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Fluoranthene)
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Fluoranthene)
Marine pollutant: yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Fluoranthene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Fluoranthene	206-44-0	2015-11-23

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Fluoranthene	206-44-0	2015-11-23

	CAS-No.	Revision Date
Fluoranthene	206-44-0	2015-11-23

New Jersey Right To Know Components

	CAS-No.	Revision Date
Fluoranthene	206-44-0	2015-11-23

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H302	Harmful if swallowed.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	1
Physical Hazard	0

NFPA Rating

Health hazard:	1
Fire Hazard:	1
Reactivity Hazard:	0

Further information

Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.9

Revision Date: 05/07/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 03/25/2019
Print Date 06/22/2019**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**Product name : Fluorene
Product Number : 128333
Brand : Aldrich
CAS-No. : 86-73-7**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 sheetCompany : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATESTelephone : +1 314 771-5765
Fax : +1 800 325-5052**1.4 Emergency telephone number**

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Warning

Hazard statement(s)
H410 : Very toxic to aquatic life with long lasting effects.Precautionary statement(s)
P273 : Avoid release to the environment.
P391 : Collect spillage.

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 H ₁₀
Molecular weight	: 166.22 g/mol
CAS-No.	: 86-73-7
EC-No.	: 201-695-5

Component	Classification	Concentration
Fluorene		
	Aquatic Acute 1; Aquatic Chronic 1; H400, H410 M-Factor - Aquatic Acute: 1	<= 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**

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): 13: Non Combustible Solids

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

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Fluorene	86-73-7	1-Hydroxypyrene	2.5 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		3-hydroxybenzo(a)pyrene		Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective

equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: crystalline Colour: white
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 111 - 114 °C (232 - 237 °F) - lit.
f) Initial boiling point and boiling range	298 °C 568 °F - lit.
g) Flash point	151.0 °C (303.8 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - > 2.0 mg/kg

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: LL5670000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information**12.1 Toxicity**

Toxicity to fish LC50 - Fish - 0.82 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates Remarks: No data available(Fluorene)

Toxicity to algae EC50 - Algae - 3.4 mg/l - 96 h

12.2 Persistence and degradability**12.3 Bioaccumulative potential**

Bioaccumulation Oncorhynchus mykiss (rainbow trout) - 24 h
- 0.0191 mg/l(Fluorene)

Bioconcentration factor (BCF): 512

12.4 Mobility in soil

Adsorbs on soil.

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life with long lasting effects.

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Fluorene)
Reportable Quantity (RQ): 5000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Fluorene)
Marine pollutant : yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Fluorene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

SECTION 15: Regulatory information

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

Chronic Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Fluorene	CAS-No.	Revision Date
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86-73-7 1993-04-24

Fluorene

CAS-No.
86-73-7

Revision Date
1993-04-24

New Jersey Right To Know Components

Fluorene

CAS-No.
86-73-7

Revision Date
1993-04-24

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

SECTION 16: Other information

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.1

Revision Date: 03/25/2019

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 5.5
Revision Date 08/09/2016
Print Date 07/17/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Heptachlor epoxide

Product Number : 49042
Brand : Supelco
Index-No. : 602-063-00-5

CAS-No. : 1024-57-3

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 2), H300
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure (Category 2), H373
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H300

Fatal if swallowed.

H351

Suspected of causing cancer.

H373

May cause damage to organs through prolonged or repeated exposure.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P281	Use personal protective equipment as required.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: Heptachlor exo-epoxide HCE exo-1,4,5,6,7,8,8-Heptachloro-2,3-epoxy-4,7-methano-3a,4,7,7a-tetrahydroindane
Formula	: C ₁₀ H ₅ Cl ₇ O
Molecular weight	: 389.32 g/mol
CAS-No.	: 1024-57-3
EC-No.	: 213-831-0
Index-No.	: 602-063-00-5

Hazardous components

Component	Classification	Concentration
Heptachlor epoxide	Acute Tox. 2; Carc. 2; STOT RE 2; Aquatic Acute 1; Aquatic Chronic 1; H300, H351, H373, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.

Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Recommended storage temperature 2 - 8 °C

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|-------------------------------------|
| a) Appearance | Form: solid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | 157.0 - 161.0 °C (314.6 - 321.8 °F) |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | No data available |

- | | |
|---|-------------------|
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | log Pow: 5.40 |
| p) Auto-ignition 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

Bulk density	1,100 kg/m ³
--------------	-------------------------

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
 Other decomposition products - No data available
 In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 15.0 mg/kg

Inhalation: No data available

Dermal: No data available

LD50 Intracerebral - Mouse - 8 mg/kg

Remarks: Behavioral: Convulsions or effect on seizure threshold.

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Heptachlor epoxide)

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: PB9450000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Blood -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - *Oncorhynchus mykiss* (rainbow trout) - 0.02 mg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates LC50 - *Daphnia magna* (Water flea) - 0.24 mg/l - 48 h

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Bioaccumulation *Pimephales promelas* (fathead minnow) - 32 d
- 0.0013 mg/l

Bioconcentration factor (BCF): 14,400

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2811 Class: 6.1 Packing group: II
Proper shipping name: Toxic solids, organic, n.o.s. (Heptachlor epoxide)
Reportable Quantity (RQ): 1 lbs
Marine pollutant: yes
Poison Inhalation Hazard: No

IMDG

UN number: 2811 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Heptachlor epoxide)

IATA

UN number: 2811 Class: 6.1 Packing group: II
Proper shipping name: Toxic solid, organic, n.o.s. (Heptachlor epoxide)

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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.

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No. 1024-57-3	Revision Date 2007-09-28
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Heptachlor epoxide

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H300	Fatal if swallowed.
H351	Suspected of causing cancer.
H373	May cause damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	4
Chronic Health Hazard:	*
Flammability:	0

Physical Hazard 0

NFPA Rating

Health hazard: 3

Fire Hazard: 0

Reactivity Hazard: 0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.5

Revision Date: 08/09/2016

Print Date: 07/17/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 05/25/2018
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Hexachloro-1,3-butadiene

Product Number : 112194
Brand : Aldrich

CAS-No. : 87-68-3

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

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 3), H301

Acute toxicity, Dermal (Category 2), H310

Skin irritation (Category 2), H315

Serious eye damage (Category 1), H318

Carcinogenicity (Category 2), H351

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)
H301 : Toxic if swallowed.

H310	Fatal in contact with skin.
H315	Causes skin irritation.
H318	Causes serious eye damage.
H351	Suspected of causing cancer.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P262	Do not get in eyes, on skin, or on clothing.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P280	Wear eye protection/ face protection.
P280	Wear protective gloves/ protective clothing.
P281	Use personal protective equipment as required.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P350 + P310	IF ON SKIN: Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor/ physician.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P361	Remove/Take off immediately all contaminated clothing.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : Perchlorobutadiene

Molecular weight : 260.76 g/mol

CAS-No. : 87-68-3

EC-No. : 201-765-5

Hazardous components

Component	Classification	Concentration
Hexachlorobuta-1,3-diene	Acute Tox. 3; Acute Tox. 2; Skin Irrit. 2; Eye Dam. 1; Carc. 2; H301, H310, H315, H318, H351	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Storage class (TRGS 510): 6.1B: Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**8.1 Control parameters**

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Hexachlorobuta-1,3-diene	87-68-3	TWA	0.020000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Kidney damage Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.020000 ppm 0.240000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A Potential for dermal absorption		
		PEL	0.02 ppm 0.24 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 480 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.2 mm

Break through time: 30 min

Material tested: Dermatril® P (KCL 743 / Aldrich Z677388, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: liquid, clear
Colour: light yellow |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -22 - -19 °C (-8 - -2 °F) - lit. |
| f) Initial boiling point and boiling range | 210 - 220 °C (410 - 428 °F) - lit. |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 0.3 hPa at 20.0 °C (68.0 °F) |
| l) Vapour density | No data available |
| m) Relative density | 1.665 g/cm ³ at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 82.0 mg/kg

LC50 Inhalation - Mouse - 370.0 mg/m³

LD50 Dermal - Rabbit - 100.0 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Skin irritation - 24 h

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Mild eye irritation - 24.00 h

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: EJ0700000

Liver injury may occur., Kidney injury may occur., Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting

Liver -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish EC50 - Oncorhynchus mykiss (rainbow trout) - 0.14 mg/l - 96
h(Hexachlorobuta-1,3-diene)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(Hexachlorobuta-1,3-diene)

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

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2279 Class: 6.1 Packing group: III

Proper shipping name: Hexachlorobutadiene

Reportable Quantity (RQ) : 1 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 2279 Class: 6.1 Packing group: III EMS-No: F-A, S-A

Proper shipping name: HEXACHLOROBUTADIENE

Marine pollutant : yes

IATA

UN number: 2279 Class: 6.1 Packing group: III

Proper shipping name: Hexachlorobutadiene

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Hexachlorobuta-1,3-diene	87-68-3	2007-07-01

Massachusetts Right To Know Components

Hexachlorobuta-1,3-diene	CAS-No. 87-68-3	Revision Date 2007-07-01
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Pennsylvania Right To Know Components

Hexachlorobuta-1,3-diene	CAS-No. 87-68-3	Revision Date 2007-07-01
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New Jersey Right To Know Components

Hexachlorobuta-1,3-diene	CAS-No. 87-68-3	Revision Date 2007-07-01
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California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer. Hexachlorobuta-1,3-diene	CAS-No. 87-68-3	Revision Date 2011-05-20
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16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

H301	Toxic if swallowed.
H310	Fatal in contact with skin.
H315	Causes skin irritation.
H318	Causes serious eye damage.
H351	Suspected of causing cancer.

HMIS Rating

Health hazard:	4
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	3
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 05/25/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 5.6
Revision Date 05/27/2016
Print Date 11/10/2018

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Hexachlorocyclopentadiene

Product Number : H6002
Brand : Aldrich
Index-No. : 602-078-00-7

CAS-No. : 77-47-4

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 1), H330
Acute toxicity, Dermal (Category 3), H311
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H302 Harmful if swallowed.
H311 Toxic in contact with skin.
H314 Causes severe skin burns and eye damage.
H330 Fatal if inhaled.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)	
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284	Wear respiratory protection.
P301 + P312	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position 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/doctor.
P320	Specific treatment is urgent (see supplemental first aid instructions on this label).
P361	Remove/Take off immediately all contaminated clothing.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
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 Hazards not otherwise classified (HNOC) or not covered by GHS

Lachrymator.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₅ Cl ₆
Molecular weight	: 272.77 g/mol
CAS-No.	: 77-47-4
EC-No.	: 201-029-3
Index-No.	: 602-078-00-7

Hazardous components

Component	Classification	Concentration
Hexachlorocyclopentadiene	Acute Tox. 4; Acute Tox. 1; Acute Tox. 3; Skin Corr. 1B; Eye Dam. 1; Aquatic Acute 1; Aquatic Chronic 1; H302, H311, H314, H330, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Moisture sensitive.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**8.1 Control parameters****Components with workplace control parameters**

Component	CAS-No.	Value	Control parameters	Basis
Hexachlorocyclopentadiene	77-47-4	TWA	0.010000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation Not classifiable as a human carcinogen		
		TWA	0.010000 ppm 0.100000 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	0.01 ppm 0.11 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: liquid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -10 °C (14 °F) - lit. |
| f) Initial boiling point and boiling range | 239 °C (462 °F) at 1,004 hPa (753 mmHg) - lit. |
| g) Flash point | 109.0 °C (228.2 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |

k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	1.702 g/cm ³ at 25 °C (77 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 315.0 mg/kg

LC50 Inhalation - Rat - 4.0 h - 2. ppm

Remarks: Behavioral:Somnolence (general depressed activity). Lungs, Thorax, or Respiration:Other changes.

LD50 Dermal - Rabbit - 430.0 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Severe skin irritation - 4 h

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Severe eye irritation - 0.1 h

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: GY1225000

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish	NOEC - Lepomis macrochirus (Bluegill) - 0.065 mg/l - 96.0 h
	LC50 - Pimephales promelas (fathead minnow) - 0.0070 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 0.21 mg/l - 24 h
	NOEC - Daphnia magna (Water flea) - 0.018 mg/l - 48 h

12.2 Persistence and degradability**12.3 Bioaccumulative potential**

Bioaccumulation	Leuciscus idus (Golden orfe) - 3 d - 0.048 mg/l
	Bioconcentration factor (BCF): 1,230

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2646 Class: 6.1 Packing group: I
Proper shipping name: Hexachlorocyclopentadiene
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: Hazard zone B

IMDG

UN number: 2646 Class: 6.1 Packing group: I EMS-No: F-A, S-A
Proper shipping name: HEXACHLOROCYCLOPENTADIENE
Marine pollutant:yes

IATA

UN number: 2646 Class: 6.1
Proper shipping name: Hexachlorocyclopentadiene
IATA Passenger: Not permitted for transport
IATA Cargo: Not permitted for transport

15. REGULATORY INFORMATION

SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Hexachlorocyclopentadiene	77-47-4	2008-11-03

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Hexachlorocyclopentadiene	77-47-4	2008-11-03

SARA 311/312 Hazards

Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Hexachlorocyclopentadiene	77-47-4	2008-11-03

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Hexachlorocyclopentadiene	77-47-4	2008-11-03

New Jersey Right To Know Components

	CAS-No.	Revision Date
Hexachlorocyclopentadiene	77-47-4	2008-11-03

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Eye Dam.	Serious eye damage
H302	Harmful if swallowed.
H311	Toxic in contact with skin.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H330	Fatal if inhaled.
H400	Very toxic to aquatic life.

HMIS Rating

Health hazard:	4
Chronic Health Hazard:	
Flammability:	1
Physical Hazard	0

NFPA Rating

Health hazard:	4
Fire Hazard:	1
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.6

Revision Date: 05/27/2016

Print Date: 11/10/2018

SAFETY DATA SHEET

Version 6.0
 Revision Date 05/28/2017
 Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Hexachloroethane

Product Number : 185442

Brand : Aldrich

CAS-No. : 67-72-1

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 Street
 ST. LOUIS MO 63103
 UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Carcinogenicity (Category 2), H351

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H315

Causes skin irritation.

H319

Causes serious eye irritation.

H335

May cause respiratory irritation.

H351

Suspected of causing cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear eye protection/ face protection.
P280	Wear protective gloves.
P281	Use personal protective equipment as required.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	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.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Perchloroethane
Formula	:	C ₂ Cl ₆
Molecular weight	:	236.74 g/mol
CAS-No.	:	67-72-1
EC-No.	:	200-666-4

Hazardous components

Component	Classification	Concentration
Hexachloroethane		
	Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; STOT SE 3; Aquatic Acute 1; Aquatic Chronic 1; H315, H319, H335, H351, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Further processing of solid materials may result in the formation of combu formation should be taken into consideration before additional processing. Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**8.1 Control parameters**

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Hexachloroethane	67-72-1	TWA	1.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Kidney damage Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	1.000000 ppm 10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix C See Appendix A Potential for dermal absorption		
		TWA	1.000000 ppm 10.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation The value in mg/m3 is approximate.		

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (EN 143) respirator cartridges as a backup to engineering controls. If th full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: crystalline
Colour: white |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 183 - 185 °C (361 - 365 °F) |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | ()No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 0.5 hPa at 20.0 °C (68.0 °F) |
| l) Vapour density | No data available |
| m) Relative density | 2.091 g/mL at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition 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

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, Strong bases

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Guinea pig - 4,970 mg/kg(Hexachloroethane)

TDL0 Oral - Rat - female - 5,500 mg/kg(Hexachloroethane)

TDL0 Oral - Rat - 6,944 mg/kg(Hexachloroethane)

Remarks: Liver:Changes in liver weight. Kidney, Ureter, Bladder:Changes in tubules (including acute renal failure, acute tubular necrosis). Kidney, Ureter, Bladder:Other changes.

TDL0 Oral - Rat - 48,750 mg/kg(Hexachloroethane)

Remarks: Brain and Coverings:Other degenerative changes. Liver:Changes in liver weight. Kidney, Ureter, Bladder:Other changes.

TDL0 Oral - Rabbit - 12,000 mg/kg(Hexachloroethane)

Remarks: Liver:Other changes. Kidney, Ureter, Bladder:Other changes. Nutritional and Gross Metabolic:Weight loss or decreased weight gain.

Inhalation: Behavioral:Muscle weakness.(Hexachloroethane)

LD50 Dermal - Rabbit - 32,000 mg/kg(Hexachloroethane)

LD50 Intraperitoneal - Mouse - 4,500 mg/kg(Hexachloroethane)

LDL0 Intraperitoneal - Rat - 2,900 mg/kg(Hexachloroethane)

LDL0 Intravenous - Dog - 325 mg/kg(Hexachloroethane)

Skin corrosion/irritation

No data available(Hexachloroethane)

Serious eye damage/eye irritation

No data available(Hexachloroethane)

Respiratory or skin sensitisation

No data available(Hexachloroethane)

Germ cell mutagenicity

(Hexachloroethane)

Hamster - ovary

Sister chromatid exchange

Carcinogenicity

This product is or contains a component that has been reported to be possi classification.(Hexachloroethane)

Limited evidence of carcinogenicity in animal studies(Hexachloroethane)

(Hexachloroethane)

(Hexachloroethane)

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Hexachloroethane)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Hexachloroethane)

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available(Hexachloroethane)

No data available(Hexachloroethane)

Specific target organ toxicity - single exposure

No data available(Hexachloroethane)

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available(Hexachloroethane)

Additional Information

RTECS: KI4025000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.(Hexachloroethane)

Kidney - (Hexachloroethane)

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish NOEC - Cyprinodon variegatus (sheepshead minnow) - 1 mg/l - 96 h(Hexachloroethane)

Toxicity to daphnia and other aquatic invertebrates LC50 - Daphnia magna (Water flea) - 1.36 mg/l - 48 h(Hexachloroethane)

12.2 Persistence and degradability

Biodegradability Result: - Not biodegradable (OECD Test Guideline 301)

12.3 Bioaccumulative potential

Bioaccumulation Lepomis macrochirus (Bluegill) - 28 d - 0.00617 mg/l(Hexachloroethane)

Bioconcentration factor (BCF): 139

12.4 Mobility in soil

No data available(Hexachloroethane)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life with long lasting effects.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chem scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Hexachloroethane)
Reportable Quantity (RQ) : 100 lbs

no

Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F

Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Hexachloroethane)
Marine pollutant : yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Hexachloroethane)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Hexachloroethane	67-72-1	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Hexachloroethane	67-72-1	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Hexachloroethane	67-72-1	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Hexachloroethane	67-72-1	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Hexachloroethane	67-72-1	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0

Reactivity Hazard: 0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 05/28/2017

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 6.1
 Revision Date 07/17/2018
 Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Indeno[1,2,3-*cd*]pyrene

Product Number : 48499

Brand : Supelco

CAS-No. : 193-39-5

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 Street
 ST. LOUIS MO 63103
 UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Carcinogenicity (Category 2), H351

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 : Warning

Hazard statement(s)
 H351 : Suspected of causing cancer.

Precautionary statement(s)
 P201 : Obtain special instructions before use.
 P202 : Do not handle until all safety precautions have been read and understood.
 P281 : Use personal protective equipment as required.
 P308 + P313 : IF exposed or concerned: Get medical advice/ attention.
 P405 : Store locked up.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none**3. COMPOSITION/INFORMATION ON INGREDIENTS****3.1 Substances**

Formula : C₂₂H₁₂
 Molecular weight : 276.33 g/mol
 CAS-No. : 193-39-5
 EC-No. : 205-893-2

Hazardous components

Component	Classification	Concentration
Indeno[1,2,3-cd]pyrene		
	Carc. 2; H351	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES**4.1 Description of first aid measures****General advice**

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods 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.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Store at room temperature.

Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

Hazardous components without workplace control parameters

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Indeno[1,2,3-cd]pyrene	193-39-5	1-Hydroxypyrene		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection

Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance	Form: solid
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	163.6 °C (326.5 °F)
f) Initial boiling point and boiling range	536.0 °C (996.8 °F)
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Indeno[1,2,3-cd]pyrene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Indeno[1,2,3-cd]pyrene)

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

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(Indeno[1,2,3-cd]pyrene)

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

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Indeno[1,2,3-cd]pyrene	193-39-5	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H351 Suspected of causing cancer.

Further information

Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1

Revision Date: 07/17/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

Version 6.0 Revision Date 10.11.2016

Print Date 17.07.2019

GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Iron Metal Clinical

Product Number : NIST937

Brand : Sigma-Aldrich

REACH No. : A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

2.2 Label elements

2.3 Other hazards - none

SECTION 3: Composition/information on ingredients

SECTION 4: First aid measures

4.1 Description of first aid measures

No data available

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**
No data available
- 5.2 **Special hazards arising from the substance or mixture**
No data available
- 5.3 **Advice for firefighters**
No data available
- 5.4 **Further information**
No data available

SECTION 6: Accidental release measures

- 6.1 **Personal precautions, protective equipment and emergency procedures**
For personal protection see section 8.
- 6.2 **Environmental precautions**
No data available
- 6.3 **Methods and materials for containment and cleaning up**
No data available
- 6.4 **Reference to other sections**
For disposal see section 13.

SECTION 7: Handling and storage

- 7.1 **Precautions for safe handling**
For precautions see section 2.2.
- 7.2 **Conditions for safe storage, including any incompatibilities**
No data available
- 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**
- 8.2 **Exposure controls**
No data available

SECTION 9: Physical and chemical properties

- 9.1 **Information on basic physical and chemical properties**
 - a) Appearance No data available
 - b) Odour No data available
 - c) Odour Threshold No data available
 - d) pH No data available
 - e) Melting point/freezing point No data available
 - f) Initial boiling point and boiling range No data available
 - g) Flash point No data available
 - h) Evaporation rate No data available
 - i) Flammability (solid, gas) No data available

j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition 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

No data available

10.2 Chemical stability

No data available

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

No data available

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

Skin corrosion/irritation

Serious eye damage/eye irritation

Respiratory or skin sensitisation

Germ cell mutagenicity

Carcinogenicity

Reproductive toxicity

Specific target organ toxicity - single exposure

Specific target organ toxicity - repeated exposure

Aspiration hazard

Additional Information

RTECS: Not available

SECTION 12: Ecological information

12.1 Toxicity

12.2 Persistence and degradability

12.3 Bioaccumulative potential

12.4 Mobility in soil

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

SECTION 13: Disposal considerations

13.1 Waste treatment methods

No data available

SECTION 14: Transport information

14.1 UN number

ADR/RID: -

IMDG: -

IATA: -

14.2 UN proper shipping name

ADR/RID: Not dangerous goods

IMDG: Not dangerous goods

IATA: Not dangerous goods

14.3 Transport hazard class(es)

ADR/RID: -

IMDG: -

IATA: -

14.4 Packaging group

ADR/RID: -

IMDG: -

IATA: -

14.5 Environmental hazards

ADR/RID: no

IMDG Marine pollutant: no

IATA: no

14.6 Special precautions for user

No data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.2 Chemical safety assessment

For this product a chemical safety assessment was not carried out

SECTION 16: Other information

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Lead

Product Number : 391352
Brand : Aldrich

CAS-No. : 7439-92-1

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - repeated exposure (Category 2), H373
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H302 Harmful if swallowed.
H351 Suspected of causing cancer.
H361 Suspected of damaging fertility or the unborn child.
H373 May cause damage to organs through prolonged or repeated exposure.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.

P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	Pb
Molecular weight	:	207.20 g/mol
CAS-No.	:	7439-92-1
EC-No.	:	231-100-4

Hazardous components

Component	Classification	Concentration
Lead		
	Acute Tox. 4; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H302, H351, H372, H410	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
	Remarks	See 1910.1025		
Lead	7439-92-1	TWA	0.05 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Confirmed animal carcinogen with unknown relevance to humans		
		TWA	0.05 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Hematologic effects Peripheral Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		

		TWA	0.05 mg/m ³	USA. NIOSH Recommended Exposure Limits
See Appendix C				

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
	-	Lead	200 µg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Not critical			

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- a) Appearance Form: powder
- b) Odour No data available

c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 327.4 °C (621.3 °F) - lit.
f) Initial boiling point and boiling range	1,740 °C (3,164 °F) - lit.
g) Flash point	Not applicable
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

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 acids

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Lead oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Rat

Cytogenetic analysis

Carcinogenicity

Limited evidence of carcinogenicity in animal studies

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Lead)

NTP: RAHC - Reasonably anticipated to be a human carcinogenThe reference note has been added by TD based on the background information of the NTP. (Lead)

OSHA: OSHA specifically regulated carcinogen (Lead)

Reproductive toxicity

Reproductive toxicity - Rat - Inhalation

Effects on Newborn: Biochemical and metabolic.

Reproductive toxicity - Rat - Oral

Effects on Newborn: Behavioral.

Reproductive toxicity - Mouse - Oral

Effects on Fertility: Female fertility index (e.g., # females pregnant per females mated). Effects on Fertility: Pre-implantation mortality (e.g., reduction in numbe corpora lutea).

May damage fertility. May damage the unborn child.

Developmental Toxicity - Rat - Inhalation

Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Blood and lymphatic system (including spleen and marrow).

Developmental Toxicity - Rat - Oral

Specific Developmental Abnormalities: Blood and lymphatic system (including spleen and marrow). Effects on Newborn: Growth statistics (e.g., reduced weight gain).

Developmental Toxicity - Rat - Oral

Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Fetal death.

Developmental Toxicity - Mouse - Oral

Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Fetal death.

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard

No data available

Additional Information

RTECS: OF7525000

anemia

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	mortality LOEC - Oncorhynchus mykiss (rainbow trout) - 1.19 mg/l - 96.0 h LC50 - Micropterus dolomieu - 2.2 mg/l - 96.0 h mortality NOEC - Salvelinus fontinalis - 1.7 mg/l - 10.0 d
Toxicity to daphnia and other aquatic invertebrates	mortality LOEC - Daphnia (water flea) - 0.17 mg/l - 24 h mortality NOEC - Daphnia (water flea) - 0.099 mg/l - 24 h
Toxicity to algae	mortality EC50 - Skeletonema costatum - 7.94 mg/l - 10 d

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Bioaccumulation	Oncorhynchus kisutch - 2 Weeks - 150 µg/l Bioconcentration factor (BCF): 12
-----------------	---

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Lead)
Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Lead)
Marine pollutant:yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Lead)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Lead	7439-92-1	2015-11-23

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Lead	7439-92-1	2015-11-23

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Lead	7439-92-1	2015-11-23

	CAS-No.	Revision Date
Lead	7439-92-1	2015-11-23

New Jersey Right To Know Components

	CAS-No.	Revision Date
Lead	7439-92-1	2015-11-23

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Lead	7439-92-1	2009-02-01

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

	CAS-No.	Revision Date
Lead	7439-92-1	2009-02-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H302	Harmful if swallowed.
H351	Suspected of causing cancer.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H373	May cause damage to organs through prolonged or repeated exposure.

Further information

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Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.11

Revision Date: 10/12/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.0
 Revision Date 01/31/2017
 Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Magnesium
 Product Number : 200905
 Brand : Sigma-Aldrich
 Index-No. : 012-002-00-9
 CAS-No. : 7439-95-4

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 Street
 ST. LOUIS MO 63103
 UNITED STATES
 Telephone : +1 314 771-5765
 Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable solids (Category 1), H228
 Self-heating substances and mixtures (Category 1), H251
 Substances and mixtures, which in contact with water, emit flammable gases (Category 2), H261

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H228 Flammable solid.
 H251 Self-heating: may catch fire.
 H261 In contact with water releases flammable gases.

Precautionary statement(s)

P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
 P223 Keep away from any possible contact with water, because of violent

P231 + P232	reaction and possible flash fire.
P235 + P410	Handle under inert gas. Protect from moisture.
P240	Keep cool. Protect from sunlight.
P241	Ground/bond container and receiving equipment.
P280	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P335 + P334	Wear protective gloves/ eye protection/ face protection.
	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P402 + P404	Store in a dry place. Store in a closed container.
P407	Maintain air gap between stacks/ pallets.
P413	Store bulk masses greater than .? kg/ .? lbs at temperatures not exceeding .? °C/ .? °F.
P420	Store away from other materials.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Combustible dust

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: Mg
Molecular weight	: 24.31 g/mol
CAS-No.	: 7439-95-4
EC-No.	: 231-104-6
Index-No.	: 012-002-00-9

Hazardous components

Component	Classification	Concentration
Magnesium (non pyrophoric)		
	Flam. Sol. 1; Self-heat. 1; Water-react. 2; H228, H251, H261	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Move out of dangerous area. Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Dry powder

5.2 Special hazards arising from the substance or mixture

Magnesium oxide

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. Keep in suitable, closed containers for disposal. Contain spillage, pick up with an electrically protected vacuum cleaner or by wet-brushing and transfer to a container for disposal according to local regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustion products. Combustion should be taken into consideration before additional processing.

Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Never allow product to get in contact with water during storage.

Store under inert gas. Air and moisture sensitive.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (EN 143) respirator cartridges as a backup to engineering controls. If th full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: Turnings |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 648 °C (1198 °F) - lit. |
| f) Initial boiling point and boiling range | 1,090 °C (1,994 °F) - lit. |
| g) Flash point | ()No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | May form combustible dust concentrations in air. |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 1 hPa at 621 °C (1150 °F) |
| l) Vapour density | No data available |
| m) Relative density | 1.74 g/mL at 25 °C (77 °F) |
| n) Water solubility | No data available |

- | | | |
|----|--|---|
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Auto-ignition temperature | The substance or mixture is classified as self heating with the category 1. |
| 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

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

Reacts violently with water.

10.4 Conditions to avoid

Heat, flames and sparks. Exposure to moisture

10.5 Incompatible materials

Acids, Strong oxidizing agents, Acid chlorides, Halogens

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Magnesium oxide

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available Magnesium (non pyrophoric)

Inhalation: No data available (Magnesium (non pyrophoric))

Dermal: No data available (Magnesium (non pyrophoric))

No data available (Magnesium (non pyrophoric))

Skin corrosion/irritation

No data available (Magnesium (non pyrophoric))

Serious eye damage/eye irritation

No data available (Magnesium (non pyrophoric))

Respiratory or skin sensitisation

No data available (Magnesium (non pyrophoric))

Germ cell mutagenicity

No data available (Magnesium (non pyrophoric))

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available(Magnesium (non pyrophoric))

No data available(Magnesium (non pyrophoric))

Specific target organ toxicity - single exposure

No data available(Magnesium (non pyrophoric))

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available(Magnesium (non pyrophoric))

Additional Information

RTECS: Not available

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, chills, Fever, fatigue, muscle pain, joint pain, rash, Anorexia.(Magnesium (non pyrophoric))

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.(Magnesium (non pyrophoric))

Liver - Irregularities - Based on Human Evidence

Liver - Irregularities - Based on Human Evidence(Magnesium (non pyrophoric))

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(Magnesium (non pyrophoric))

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

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Contact a licensed professional waste disposal service to dispose of this material. Burn in a chemical incinerator equipped with an afterburner and scrubber b highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1869 Class: 4.1 Packing group: III
Proper shipping name: Magnesium
Poison Inhalation Hazard: No

IMDG

UN number: 1869 Class: 4.1 Packing group: III EMS-No: F-G, S-G
Proper shipping name: MAGNESIUM

IATA

UN number: 1869 Class: 4.1 Packing group: III
Proper shipping name: Magnesium

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

Fire Hazard, Reactivity Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Magnesium (non pyrophoric)	7439-95-4	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Magnesium (non pyrophoric)	7439-95-4	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Magnesium (non pyrophoric)	7439-95-4	1993-04-24

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H228 Flammable solid.
H251 Self-heating: may catch fire.
H261 In contact with water releases flammable gases.

HMIS Rating

Health hazard: 0
Chronic Health Hazard: *
Flammability: 3
Physical Hazard 2

NFPA Rating

Health hazard: 0
Fire Hazard: 0
Reactivity Hazard: 2

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 01/31/2017

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 05/28/2017
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Manganese

Product Number : 463728

Brand : Aldrich

CAS-No. : 7439-96-5

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Substances and mixtures, which in contact with water, emit flammable gases (Category 1), H260

Acute aquatic toxicity (Category 3), H402

Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H260

In contact with water releases flammable gases which may ignite spontaneously.

H412

Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P223

Keep away from any possible contact with water, because of violent reaction and possible flash fire.

P231 + P232

Handle under inert gas. Protect from moisture.

P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P402 + P404	Store in a dry place. Store in a closed container.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: Mn
Molecular weight	: 54.94 g/mol
CAS-No.	: 7439-96-5
EC-No.	: 231-105-1

Hazardous components

Component	Classification	Concentration
Manganese		
	Water-react. 1; Aquatic Acute 3; Aquatic Chronic 3; H260, H412	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Dry powder Carbon dioxide (CO₂)

Unsuitable extinguishing media

Water

5.2 Special hazards arising from the substance or mixture

Manganese/manganese oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Never allow product to get in contact with water during storage.

Moisture sensitive. Keep in a dry place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Manganese	7439-96-5	TWA	0.200000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC)		
		C	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Ceiling limit is to be determined from breathing-zone air samples.		
		C	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Ceiling limit is to be determined from breathing-zone air samples.		

		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	3.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	3.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		C	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Ceiling limit is to be determined from breathing-zone air samples.		
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	3.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.200000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) varies		
		TWA	0.100000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment 2015 Adoption varies		
		TWA	0.020000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment 2015 Adoption varies		
		TWA	1 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	3 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Not classifiable as a human carcinogen varies		
		TWA	0.02 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Not classifiable as a human carcinogen varies		

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection

Impervious clothing, Flame retardant protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (EN 143) respirator cartridges as a backup to engineering controls. If th full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: powder
Colour: grey |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 1,244 °C (2,271 °F) - lit. |
| f) Initial boiling point and boiling range | 1,962 °C (3,564 °F) - lit. |
| g) Flash point | ()Not applicable |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | 7.3 g/mL at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition 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

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

Reacts violently with water.

10.4 Conditions to avoid

Exposure to moisture

10.5 Incompatible materials

acids, Halogens, Bases, Phosphorus, Sulphur oxides, Peroxides

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Manganese/manganese oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 9,000 mg/kg(Manganese)

Inhalation: No data available(Manganese)

Dermal: No data available(Manganese)

No data available(Manganese)

Skin corrosion/irritation

Skin - Rabbit(Manganese)

Result: Mild skin irritation - 24 h

Serious eye damage/eye irritation

Eyes - Rabbit(Manganese)

Result: Mild eye irritation - 24 h

Respiratory or skin sensitisation

No data available(Manganese)

Germ cell mutagenicity

No data available(Manganese)

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available(Manganese)

May cause reproductive disorders.(Manganese)

Specific target organ toxicity - single exposure

No data available(Manganese)

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available(Manganese)

Additional Information

RTECS: OO9275000

Men exposed to manganese dusts showed a decrease in fertility. Chronic man system. Early symptoms include languor, sleepiness and weakness in the le disturbances such as uncontrollable laughter and a spastic gait with tend cases. High incidence of pneumonia has been found in workers exposed to t(Manganese)

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence(Manganese)

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 40 mg/l - 48 h(Manganese)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(Manganese)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Harmful to aquatic life.

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

Burn in a chemical incinerator equipped with an afterburner and scrubber b highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 3208 Class: 4.3 Packing group: I
Proper shipping name: Metallic substance, water-reactive, n.o.s. (Manganese)
Poison Inhalation Hazard: No

IMDG

UN number: 3208 Class: 4.3 Packing group: I EMS-No: F-G, S-N
Proper shipping name: METALLIC SUBSTANCE, WATER-REACTIVE, N.O.S. (Manganese)

IATA

UN number: 3208 Class: 4.3 Packing group: I
 Proper shipping name: Metallic substance, water-reactive, n.o.s. (Manganese)
 IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION**SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

SARA 311/312 Hazards

Reactivity Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

H260	In contact with water releases flammable gases which may ignite spontaneously.
H402	Harmful to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	2

NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	2
Special hazard.I:	W

Further information

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 The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling

or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1

Revision Date: 05/28/2017

Print Date: 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Mercury

Product Number : 215457
Brand : Sigma-Aldrich
Index-No. : 080-001-00-0

CAS-No. : 7439-97-6

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Inhalation (Category 2), H330
Reproductive toxicity (Category 1B), H360
Specific target organ toxicity - repeated exposure (Category 1), H372
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H330 Fatal if inhaled.
H360 May damage fertility or the unborn child.
H372 Causes damage to organs through prolonged or repeated exposure.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.

P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284	Wear respiratory protection.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	Hg
Molecular weight	:	200.59 g/mol
CAS-No.	:	7439-97-6
EC-No.	:	231-106-7
Index-No.	:	080-001-00-0

Hazardous components

Component	Classification	Concentration
Mercury		
	Acute Tox. 2; Repr. 1B; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H330, H360, H372, H410	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal. In some instances, a mercury spill kit may be used. Please consult with your site EHS representative to determine the most appropriate clean up method. Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Store under inert gas.

Storage class (TRGS 510): 6.1B: Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Mercury	7439-97-6	C	0.1 mg/m ³	USA. NIOSH Recommended Exposure Limits
	Remarks	Potential for dermal absorption		
		CEIL	1.0mg/10m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		TWA	0.05 mg/m ³	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		

		TWA	0.025 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Kidney damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	0.05 mg/m ³	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---------------|---------------------------------------|
| a) Appearance | Form: liquid
Colour: silver, white |
|---------------|---------------------------------------|

b) Odour	odourless
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: -38.87 °C (-37.97 °F) - lit.
f) Initial boiling point and boiling range	356.6 °C (673.9 °F) - lit.
g) Flash point	Not applicable
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	< 0.01 hPa (< 0.01 mmHg) at 20 °C (68 °F) 1 hPa (1 mmHg) at 126 °C (259 °F)
l) Vapour density	6.93 - (Air = 1.0)
m) Relative density	13.55 g/cm ³ at 25 °C (77 °F)
n) Water solubility	0.00006 g/l at 25 °C (77 °F)
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

Relative vapour density 6.93 - (Air = 1.0)

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, Ammonia, Azides, Nitrates, Chlorates, Copper

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Mercury/mercury oxides.

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

LC50 Inhalation - Rat - male - 2 h - < 27 mg/m³

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

Presumed human reproductive toxicant

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard

No data available

Additional Information

RTECS: OV4550000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish mortality LC50 - Cyprinus carpio (Carp) - 0.160 mg/l - 96 h

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Bioaccumulation Carassius auratus (goldfish) - 1,789 d
- 0.25 µg/l

Bioconcentration factor (BCF): 155,986

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2809 Class: 8 (6.1) Packing group: III
Proper shipping name: A. W. Mercury
Reportable Quantity (RQ): 1 lbs
Poison Inhalation Hazard: No

IMDG

IATA

UN number: 2809 Class: 8 (6.1) Packing group: III
Proper shipping name: Mercury

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

Mercury

CAS-No. Revision Date
7439-97-6 2015-11-23

Pennsylvania Right To Know Components

Mercury

CAS-No. Revision Date
7439-97-6 2015-11-23

Mercury

CAS-No. Revision Date
7439-97-6 2015-11-23

New Jersey Right To Know Components

Mercury

CAS-No. Revision Date
7439-97-6 2015-11-23

California Prop. 65 Components

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.
Mercury

CAS-No.
7439-97-6

Revision Date
2013-12-20

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H330	Fatal if inhaled.
H360	May damage fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
Repr.	Reproductive toxicity

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.15

Revision Date: 03/05/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

Version 6.1

Revision Date 08.07.2019

Print Date 17.07.2019

GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Methylene chloride
Product Number : M1550000
Brand : Sigma-Aldrich
REACH No. : 01-2119480404-41-XXXX
CAS-No. : 75-09-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES
Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008

Skin irritation (Category 2), H315

Eye irritation (Category 2), H319

Carcinogenicity (Category 2), H351

Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 Label elements

Labelling according Regulation (EC) No 1272/2008

Pictogram



Signal word

Warning

Hazard statement(s)

H315

Causes skin irritation.

H319

Causes serious eye irritation.

H336

May cause drowsiness or dizziness.

Sigma-Aldrich- M1550000

Page 1 of 9

The life science business of Merck operates as MilliporeSigma in the US and Canada



H351	Suspected of causing cancer.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P302 + P352	IF ON SKIN: Wash with plenty of water.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
Supplemental Hazard Statements	none

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	: CH ₂ Cl ₂
Molecular weight	: 84,93 g/mol
CAS-No.	: 75-09-2

Component	Classification	Concentration
Methylene chloride		
	Skin Irrit. 2; Eye Irrit. 2; Carc. 2; STOT SE 3; H315, H319, H351, H336 Concentration limits: 20 %: STOT SE 3, H336;	<= 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

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.



4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Store in cool place.

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

Components with workplace control parameters

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

The selected protective gloves have to satisfy the specifications of Regulation (EU) 2016/425 and the standard EN 374 derived from it.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|---------------------------------|------------------------------------|
| a) Appearance | Form: liquid
Colour: colourless |
| b) Odour | ether-like |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point: -95 °C at 1.013 hPa |



f)	Initial boiling point and boiling range	40 °C at 1.013 hPa
g)	Flash point	- closed cup does not flash
h)	Evaporation rate	0,71
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 22 %(V) Lower explosion limit: 13 %(V)
k)	Vapour pressure	584 hPa at 25 °C
l)	Vapour density	2,93
m)	Relative density	1,33 g/cm ³ at 20 °C
n)	Water solubility	13,2 g/l at 25 °C
o)	Partition coefficient: n-octanol/water	log Pow: 1,25 at 20 °C - Bioaccumulation is not expected.
p)	Auto-ignition temperature	605 °C at 1.013 hPa - DIN 51794
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

Relative vapour density	2,93
-------------------------	------

SECTION 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

various plastics, Rubber, Light metals, Metals, Mild steel, Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

In the event of fire: see section 5



SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male and female - > 2.000 mg/kg
(OECD Test Guideline 401)

LC50 Inhalation - Mouse - 4 h - 86 mg/l

Remarks: (ECHA)

LD50 Dermal - Rat - male and female - > 2.000 mg/kg
(OECD Test Guideline 402)

Skin corrosion/irritation

Skin - Rabbit

Result: Irritations - 4 h
(OECD Test Guideline 404)

Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Eye irritation

Remarks: (ECHA)

Risk of corneal clouding.

Respiratory or skin sensitisation

Local lymph node assay (LLNA) - Mouse

Result: negative
(OECD Test Guideline 429)

Germ cell mutagenicity

Mutagenicity (mammal cell test): chromosome aberration.
Chinese hamster ovary cells

Result: positive

Ames test

Salmonella typhimurium

Result: positive

OECD Test Guideline 474

Mouse - male and female - Bone marrow

Result: negative

Carcinogenicity

Limited evidence of carcinogenicity in animal studies
Suspected human carcinogens

IARC: 2A - Group 2A: Probably carcinogenic to humans (Methylene chloride)

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

Inhalation - May cause drowsiness or dizziness. - Central nervous system

Acute oral toxicity - Nausea, Vomiting, Risk of aspiration upon vomiting., Aspiration may cause pulmonary oedema and pneumonitis.

Acute inhalation toxicity - Possible damages: , mucosal irritations

Specific target organ toxicity - repeated exposure

No data available



Aspiration hazard

No data available

Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 104 Weeks - No observed adverse effect level - 6 mg/kg

Repeated dose toxicity - Rat - male and female - Inhalation - 104 Weeks

RTECS: Not available

Dizziness, Nausea, Vomiting, narcosis, Cough, irritant effects, Unconsciousness, Shortness of breath, respiratory paralysis, somnolence, depressed respiration, CNS disorders, inebriation

Risk of corneal clouding.

The following applies to aliphatic halogenated hydrocarbons in general: sy effect on liver, kidneys.

Dichloromethane is metabolized in the body producing carbon monoxide which increases and sustains carboxyhemoglobin levels in the blood, reducing the oxygen-carrying capacity of the blood.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 193,00 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	static test LC50 - Daphnia magna (Water flea) - 27 mg/l - 48 h (US-EPA)
Toxicity to bacteria	static test EC50 - activated sludge - 2.590 mg/l - 40 min (OECD Test Guideline 209)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: 68 % - Readily biodegradable. (OECD Test Guideline 301D)
------------------	---

12.3 Bioaccumulative potential

Bioaccumulation	Cyprinus carpio (Carp) - 6 Weeks - 250 µg/l(Methylene chloride)
	Bioconcentration factor (BCF): 2 - 5,4 (OECD Test Guideline 305)
	Cyprinus carpio (Carp) - 6 Weeks - 25 µg/l(Methylene chloride)
	Bioconcentration factor (BCF): 6 - 40 (OECD Test Guideline 305)



12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Waste material must be disposed of in accordance with the Directive on waste 2008/98/EC as well as other national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

14.1 UN number

ADR/RID: 1593

IMDG: 1593

IATA: 1593

14.2 UN proper shipping name

ADR/RID: DICHLOROMETHANE

IMDG: DICHLOROMETHANE

IATA: Dichloromethane

14.3 Transport hazard class(es)

ADR/RID: 6.1

IMDG: 6.1

IATA: 6.1

14.4 Packaging group

ADR/RID: III

IMDG: III

IATA: III

14.5 Environmental hazards

ADR/RID: no

IMDG Marine pollutant: no

IATA: no

14.6 Special precautions for user

No data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

Authorisations and/or restrictions on use

REACH - Restrictions on the manufacture, :
placing on the market and use of certain
dangerous substances, preparations and articles



(Annex XVII)

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, preparations and articles (Annex XVII) : Methylene chloride

15.2 Chemical safety assessment

For this product a chemical safety assessment was not carried out

SECTION 16: Other information

Full text of H-Statements referred to under sections 2 and 3.

H315	Causes skin irritation.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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SAFETY DATA SHEET

Version 6.1
Revision Date 05/26/2018
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Naphthalene

Product Number : 147141
Brand : Aldrich
Index-No. : 601-052-00-2

CAS-No. : 91-20-3

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable solids (Category 2), H228

Acute toxicity, Oral (Category 4), H302

Carcinogenicity (Category 2), H351

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Warning

Hazard statement(s)	
H228	Flammable solid.
H302	Harmful if swallowed.
H351	Suspected of causing cancer.
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting equipment.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Molecular weight	: 128.17 g/mol
CAS-No.	: 91-20-3
EC-No.	: 202-049-5
Index-No.	: 601-052-00-2

Hazardous components

Component	Classification	Concentration
Naphthalene		
	Flam. Sol. 2; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H228, H302, H351, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal. Contain spillage, pick up with an electrically protected vacuum cleaner or by wet-brushing and transfer to a container for disposal according to local regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): 4.1B: Flammable solid hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**8.1 Control parameters****Components with workplace control parameters**

Component	CAS-No.	Value	Control parameters	Basis
Naphthalene	91-20-3	TWA	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Hemolytic anemia Upper Respiratory Tract irritation Cataract Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	10 ppm 50 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	15 ppm 75 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	10 ppm 50 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		PEL	0.1 ppm 0.5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Naphthalene	91-20-3	1-Naphthol + 2-Naphthol			ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: flakes, granules
Colour: white |
| b) Odour | aromatic |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 80 - 82 °C (176 - 180 °F) - lit. |
| f) Initial boiling point and boiling range | 218 °C (424 °F) - lit. |
| g) Flash point | 80.0 °C (176.0 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 5.9 %(V)
Lower explosion limit: 0.9 %(V) |
| k) Vapour pressure | 1.3 hPa at 53.0 °C (127.4 °F)
0.04 hPa at 25.0 °C(77.0 °F) |
| l) Vapour density | No data available |
| m) Relative density | 1.085 g/cm ³ at 24.7 °C (76.5 °F) |
| n) Water solubility | 0.0308 g/l at 25 °C (77 °F) - OECD Test Guideline 105 - slightly soluble |
| o) Partition coefficient: n-octanol/water | log Pow: 3.4 at 25 °C (77 °F) |
| p) Auto-ignition temperature | 526.0 °C (978.8 °F) |
| q) Decomposition temperature | No data available |
| r) Viscosity | 1.05 mm ² /s at 81.5 °C (178.7 °F) - |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety information

- | | |
|-----------------|----------------------------------|
| Surface tension | 31.8 mN/m at 100.0 °C (212.0 °F) |
|-----------------|----------------------------------|

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 490.0 mg/kg

LC50 Inhalation - Rat - male and female - 4 h - > 0.4 mg/l
(OECD Test Guideline 403)

LD50 Dermal - Rabbit - 20,000 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation - 24 h

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Mild eye irritation

Respiratory or skin sensitisation

Maximisation Test - Guinea pig

Result: Does not cause skin sensitisation.
(OECD Test Guideline 406)

Germ cell mutagenicity

Ames test

S. typhimurium

Result: negative

Rat - male

Result: negative

Carcinogenicity

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Naphthalene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Naphthalene)

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

Repeated dose toxicity - Rat - male and female - Oral - No observed adverse effect level - 100 mg/kg - Lowest observed adverse effect level - 400 mg/kg
RTECS: QJ0525000

Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed 2 to 4 hours or longer., Naphthalene is retinotoxic and systemic absorption of its vapors above 15ppm, may result in: cataracts, optic neuritis, corneal injury, Eye irritation, Ingestion may provoke the following symptoms: hemolytic anemia, hemoglobinuria, Nausea, Headache, Vomiting, Gastrointestinal disturbance, Convulsions, anemia, Kidney injury may occur., Seizures., Coma.

Heart -

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish flow-through test LC50 - Pimephales promelas (fathead minnow) - 7.9 mg/l - 96 h(Naphthalene)
(OECD Test Guideline 203)

Toxicity to daphnia and other aquatic invertebrates static test EC50 - Daphnia magna (Water flea) - 2.16 mg/l - 48 h(Naphthalene)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 d(Naphthalene)
Result: 2 % - Not readily biodegradable.

12.3 Bioaccumulative potential

Bioaccumulation Fish(Naphthalene)

Bioconcentration factor (BCF): 427 - 1,158

12.4 Mobility in soil

No data available(Naphthalene)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 1334

Class: 4.1

Packing group: III

Proper shipping name: Naphthalene, refined
Reportable Quantity (RQ) : 100 lbs

Marine pollutant: no
Poison Inhalation Hazard: No

IMDG

UN number: 1334 Class: 4.1 Packing group: III EMS-No: F-A, S-G
Proper shipping name: NAPHTHALENE, REFINED
Marine pollutant : yes

IATA

UN number: 1334 Class: 4.1 Packing group: III
Proper shipping name: Naphthalene, refined

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-03-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Naphthalene	91-20-3	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H228 Flammable solid.
H302 Harmful if swallowed.
H351 Suspected of causing cancer.
H400 Very toxic to aquatic life.
H410 Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard: 2
Chronic Health Hazard: *
Flammability: 2
Physical Hazard 2

NFPA Rating

Health hazard: 2
Fire Hazard: 2
Reactivity Hazard: 2

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1

Revision Date: 05/26/2018

Print Date: 06/28/2019



N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830 and according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 04/03/2019

Revision date:

Version: 1.0

DLM-10664-S

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form : Mixtures
Product name : N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL
Product code : DLM-10664-S

1.2. Relevant identified uses of the substance or mixture and uses advised against

1.2.1. Relevant identified uses

Main use category : Professional use
Industrial/Professional use spec : For professional use only

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

Cambridge Isotope Laboratories, Inc.
50 Frontage Road
Andover, MA 01810
USA

USA: 1-800-322-1174 Int: 1-978-749-8000
cilsales@isotope.com www.isotope.com

Emergency telephone number

Emergency numbers:

Chemtrec: 1-800-424-9300 (24 hours)
International: 1-703-741-5970 (24 hours)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Flam. Liq. 2	H225
Acute Tox. 3 (Oral)	H301
Acute Tox. 3 (Dermal)	H311
Acute Tox. 3 (Inhalation)	H331
Skin Irrit. 2	H315
Eye Irrit. 2	H319
STOT SE 1	H370

Full text of hazard classes and H-statements : see section 16

Classification according to Directive 67/548/EEC [DSD] or 1999/45/EC [DPD]

F; R11
T; R39/23/24/25
Xi; R36/38

Full text of R-phrases: see section 16

GHS-US classification

Flam. Liq. 2	H225
Acute Tox. 3 (Oral)	H301
Acute Tox. 3 (Dermal)	H311
Acute Tox. 3 (Inhalation:vapour)	H331
Skin Irrit. 2	H315
Eye Irrit. 2A	H319
STOT SE 1	H370

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Full text of H statements : see section 16

Adverse physicochemical, human health and environmental effects

Eyes, Kidney, Liver, Heart, Central nervous system. Highly flammable liquid and vapor. Causes damage to organs (eyes, kidneys, liver, heart, central nervous system) (if inhaled, if swallowed, in contact with skin). Toxic in contact with skin. Toxic if inhaled. Toxic if swallowed. Causes skin irritation. Causes serious eye irritation.

2.2. Label elements

Labeling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP)



Signal word (CLP)

: Danger

Hazardous ingredients

: 100% METHANOL UNLABELED

Hazard statements (CLP)

: H225 - Highly flammable liquid and vapor
H301+H311+H331 - Toxic if swallowed, in contact with skin or if inhaled
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H370 - Causes damage to organs (eyes, heart, kidneys, liver, central nervous system) (in contact with skin, if inhaled, if swallowed)

Precautionary statements (CLP)

: P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233 - Keep container tightly closed.
P240 - Ground/bond container and receiving equipment.
P241 - Use explosion-proof electrical, lighting, ventilating equipment
P260 - Do not breathe dust, mist, vapors, fume, gas, spray.
P264 - Wash hands, forearms and face thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.
P271 - Use only outdoors or in a well-ventilated area.

GHS-US labeling

Hazard pictograms (GHS-US)



Signal word (GHS-US)

: Danger

Hazard statements (GHS-US)

: H225 - Highly flammable liquid and vapor
H301+H311+H331 - Toxic if swallowed, in contact with skin or if inhaled
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H370 - Causes damage to organs (eyes, kidneys, liver, heart, central nervous system) (Dermal, Inhalation, oral)

Precautionary statements (GHS-US)

: P210 - Keep away from heat, open flames, sparks. - No smoking.
P233 - Keep container tightly closed.
P240 - Ground/Bond container and receiving equipment
P241 - Use explosion-proof electrical, lighting, ventilating equipment
P242 - Use only non-sparking tools.
P243 - Take precautionary measures against static discharge.
P260 - Do not breathe dust, fume, mist, gas, spray, vapors.
P261 - Avoid breathing dust, fume, gas, spray, vapors, mist.
P264 - Wash hands, forearms and face 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 clothing, protective gloves.
P301+P310 - If swallowed: Immediately call a doctor, a POISON CENTER
P302+P352 - If on skin: Wash with plenty of water
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

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lenses, if present and easy to do. Continue rinsing
P307+P311 - If exposed: Call a poison center/doctor
P311 - Call a doctor, a POISON CENTER
P312 - Call a doctor, a POISON CENTER if you feel unwell
P321 - Specific treatment (see Hazardous component(s) for labeling on this label)
P322 - Specific treatment (see Hazard pictograms (CLP) on this label)
P330 - Rinse mouth.
P332+P313 - If skin irritation occurs: Get medical advice/attention.
P337+P313 - If eye irritation persists: Get medical advice/attention.
P361+P364 - Take off immediately all contaminated clothing and wash it before reuse.
P362+P364 - Take off contaminated clothing and wash it before reuse.
P370+P378 - In case of fire: Use alcohol resistant foam, carbon dioxide (CO₂), dry extinguishing powder to extinguish.
P403+P233 - Store in a well-ventilated place. Keep container tightly closed.
P403+P235 - Store in a well-ventilated place. Keep cool.
P405 - Store locked up.
P501 - Dispose of contents/container to hazardous or special waste collection point, in accordance with local, regional, national and/or international regulation

2.3. Other hazards

PBT: not relevant – no registration required

SECTION 3: Composition/Information on ingredients

3.1. Substances

Not applicable

3.2. Mixtures

Name	Product identifier	%	Classification according to Directive 67/548/EEC
100% METHANOL UNLABELED	(CAS-No.) 67-56-1 (EC-No.) 200-659-6 (EC Index-No.) 603-001-00-X (REACH-no) 01-2119433307-44	99.9937	F; R11 T; R39/23/24/25 Xi; R36/38
N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%)	(CAS-No.) 2991-50-6 (Unlabeled)	0.0063	Xi; R36/37/38

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
100% METHANOL UNLABELED	(CAS-No.) 67-56-1 (EC-No.) 200-659-6 (EC Index-No.) 603-001-00-X (REACH-no) 01-2119433307-44	99.9937	Flam. Liq. 2, H225 Acute Tox. 3 (Oral), H301 Acute Tox. 3 (Dermal), H311 Acute Tox. 3 (Inhalation:vapour), H331 Skin Irrit. 2, H315 Eye Irrit. 2, H319 STOT SE 1, H370
N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%)	(CAS-No.) 2991-50-6 (Unlabeled)	0.0063	Skin Irrit. 2, H315 Eye Irrit. 2, H319 STOT SE 3, H335

Name	Product identifier	%	GHS-US classification
100% METHANOL UNLABELED	(CAS-No.) 67-56-1	99.9937	Flam. Liq. 2, H225 Acute Tox. 3 (Oral), H301 Acute Tox. 3 (Dermal), H311 Acute Tox. 3 (Inhalation:vapour), H331 Skin Irrit. 2, H315 Eye Irrit. 2A, H319 STOT SE 1, H370
N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%)	(CAS-No.) 2991-50-6 (Unlabeled)	0.0063	Skin Irrit. 2, H315 Eye Irrit. 2, H319 STOT SE 3, H335

Full text of R- and H- phrases: see section 16

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : If medical advice is needed, have product container or label at hand. Call a physician immediately. Evacuate danger area.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Call a doctor.

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First-aid measures after skin contact	: Rinse skin with water/shower. Take immediately victim to hospital. Remove/Take off immediately all contaminated clothing. If skin irritation occurs: 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. If eye irritation persists: Get medical advice/attention.
First-aid measures after ingestion	: Do not induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth. Call a physician immediately.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/effects	: Causes damage to organs (Eyes, heart, liver, kidneys, central nervous system, Skin) (in contact with skin, if inhaled, if swallowed).
Symptoms/effects after inhalation	: Toxic if inhaled.
Symptoms/effects after skin contact	: Toxic in contact with skin. Causes skin irritation.
Symptoms/effects after eye contact	: Causes serious eye irritation.
Symptoms/effects after ingestion	: Toxic if swallowed.

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	: Dry powder. Dry sand.
Unsuitable extinguishing media	: Do not use a heavy water stream.

5.2. Special hazards arising from the substance or mixture

Fire hazard	: Highly flammable liquid and vapor.
Reactivity	: Vapors may form flammable mixture with air. Highly flammable liquid and vapor.

5.3. Advice for firefighters

Firefighting instructions	: Do not enter fire area without proper protective equipment, including respiratory protection.
Protection during firefighting	: Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing. Wear recommended personal protective equipment.
Other information	: Use water spray to cool exposed surfaces.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Emergency procedures	: Wear respiratory protection. Do not breathe dust, mist, gas, spray, vapors, fume. Avoid contact with skin, eyes and clothing. Ventilate spillage area. Remove all sources of ignition. No open flames, no sparks, and no smoking. Ensure adequate air ventilation. Special attention should be given to low areas/pits where flammable vapors can accumulate.
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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".
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6.2. Environmental precautions

Prevent entry to sewers and public waters. Do not allow to enter drains or water courses. Avoid release to the environment.

6.3. Methods and material for containment and cleaning up

For containment	: Dike and contain spill.
Methods for cleaning up	: Take up liquid spill into absorbent material. Notify authorities if product enters sewers or public waters. This material and its container must be disposed of in a safe way, and as per local legislation.
Other information	: Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Ground/bond container and receiving equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Flammable vapors may accumulate in the container. Use explosion-proof equipment. Wear personal protective equipment. Do not breathe dust, fume, gas, spray, vapors, mist. Do not get in eyes, on skin, or on clothing. Use only outdoors or in a well-ventilated area.
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N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL

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Hygiene measures : Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product. Wash contaminated clothing before reuse. 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 : Ground/bond container and receiving equipment. Store in a well-ventilated place. Keep container tightly closed. Store locked up.

Storage conditions : Store at room temperature away from light and moisture.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL		
Italy - Portugal - USA ACGIH	ACGIH TWA (ppm)	200.00000000 ppm Basis: USA. ACGIH Threshold Limit Values (TLV)
Italy - Portugal - USA ACGIH	ACGIH STEL (ppm)	250 ppm Basis: USA. ACGIH Threshold Limit Values (TLV)
Italy - Portugal - USA ACGIH	Remark (ACGIH)	Headache. Nausea. Dizziness. Eye damage. Substances for which there is a Biological Exposure Index or Indices (see BEI section). Danger of cutaneous absorption.
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	260 mg/m ³ Basis: NIOSH Recommended Exposure Limits
USA NIOSH	NIOSH REL (TWA) (ppm)	200 ppm Basis: NIOSH Recommended Exposure Limits
USA NIOSH	NIOSH REL (STEL) (mg/m ³)	325 mg/m ³ Basis: NIOSH Recommended Exposure Limits
USA NIOSH	NIOSH REL (STEL) (ppm)	250 ppm Basis: NIOSH Recommended Exposure Limits
USA NIOSH	Remark (NIOSH)	Potential for dermal absorption.
USA OSHA	OSHA PEL (TWA) (mg/m ³)	260 mg/m ³ Basis: USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants - 1910.1000. California permissible exposure limits for chemical contaminants (Title 8, Article 107)
USA OSHA	OSHA PEL (TWA) (ppm)	200 ppm Basis: USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants - 1910.1000. California permissible exposure limits for chemical contaminants (Title 8, Article 107)
USA OSHA	OSHA PEL (STEL) (mg/m ³)	325 mg/m ³ Basis: USA. OSHA - Table Z-1 Limits for Air Contaminants - 1910.1000. California permissible exposure limits for chemical contaminants (Title 8, Article 107)
USA OSHA	OSHA PEL (STEL) (ppm)	250 ppm Basis: USA. OSHA - Table Z-1 Limits for Air Contaminants - 1910.1000. California permissible exposure limits for chemical contaminants (Title 8, Article 107)
USA OSHA	OSHA PEL (Ceiling) (ppm)	1000 ppm California permissible exposure limits for chemical contaminants (Title 8, Article 107)
USA OSHA	Remark (OSHA)	The value in mg/m ³ is approximate. Skin notation.
100% METHANOL UNLABELED (67-56-1)		
Italy - Portugal - USA ACGIH	ACGIH TWA (ppm)	200.00000000 ppm Basis: USA. ACGIH Threshold Limit Values (TLV)
Italy - Portugal - USA ACGIH	ACGIH STEL (ppm)	250 ppm Basis: USA. ACGIH Threshold Limit Values (TLV)
Italy - Portugal - USA ACGIH	Remark (ACGIH)	Headache. Nausea. Dizziness. Eye damage. Substances for which there is a Biological Exposure Index or Indices (see BEI section). Danger of cutaneous absorption.
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	260 mg/m ³ Basis: NIOSH Recommended Exposure Limits

N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL

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100% METHANOL UNLABELED (67-56-1)		
USA NIOSH	NIOSH REL (TWA) (ppm)	200 ppm Basis: NIOSH Recommended Exposure Limits
USA NIOSH	NIOSH REL (STEL) (mg/m ³)	325 mg/m ³ Basis: NIOSH Recommended Exposure Limits
USA NIOSH	NIOSH REL (STEL) (ppm)	250 ppm Basis: NIOSH Recommended Exposure Limits
USA NIOSH	Remark (NIOSH)	Potential for dermal absorption.
USA OSHA	OSHA PEL (TWA) (mg/m ³)	260 mg/m ³ Basis: USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants - 1910.1000. California permissible exposure limits for chemical contaminants (Title 8, Article 107)
USA OSHA	OSHA PEL (TWA) (ppm)	200 ppm Basis: USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants - 1910.1000. California permissible exposure limits for chemical contaminants (Title 8, Article 107)
USA OSHA	OSHA PEL (STEL) (mg/m ³)	325 mg/m ³ Basis: USA. OSHA - Table Z-1 Limits for Air Contaminants - 1910.1000. California permissible exposure limits for chemical contaminants (Title 8, Article 107)
USA OSHA	OSHA PEL (STEL) (ppm)	250 ppm Basis: USA. OSHA - Table Z-1 Limits for Air Contaminants - 1910.1000. California permissible exposure limits for chemical contaminants (Title 8, Article 107)
USA OSHA	OSHA PEL (Ceiling) (ppm)	1000 ppm California permissible exposure limits for chemical contaminants (Title 8, Article 107)
USA OSHA	Remark (OSHA)	The value in mg/m ³ is approximate. Skin notation.

N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL

DNEL/DMEL (Workers)

Acute - systemic effects, dermal	40 mg/kg bodyweight/day
Acute - systemic effects, inhalation	260 mg/m ³
Acute - local effects, dermal	260 mg/cm ²
Long-term - systemic effects, dermal	40 mg/kg bodyweight/day
Long-term - local effects, dermal	260 mg/cm ²
Long-term - local effects, inhalation	260 mg/m ³

DNEL/DMEL (General population)

Acute - systemic effects, dermal	8 mg/kg body weight
Acute - systemic effects, inhalation	50 mg/m ³
Acute - systemic effects, oral	8 mg/kg body weight
Acute - local effects, inhalation	50 mg/m ³
Long-term - systemic effects, oral	8 mg/kg bodyweight/day
Long-term - systemic effects, inhalation	50 mg/m ³
Long-term - systemic effects, dermal	8 mg/kg bodyweight/day
Long-term - local effects, inhalation	50 mg/m ³

PNEC (Water)

PNEC aqua (freshwater)	154 mg/l
PNEC aqua (marine water)	15.4 mg/l

PNEC (Sediment)

PNEC sediment (freshwater)	570.4 mg/kg dwt
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PNEC (Soil)

PNEC soil	23.5 mg/kg dwt
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PNEC (STP)

PNEC sewage treatment plant	100 mg/kg
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8.2. Exposure controls

Appropriate engineering controls

: Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL

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Personal protective equipment : Gloves. Protective clothing. Protective goggles. Self-contained breathing apparatus.



Materials for protective clothing : Wear suitable protective clothing and gloves.
Hand protection : Wear suitable protective clothing and gloves.
Eye protection : Wear eye protection. Chemical goggles or face shield with safety glasses.
Skin and body protection : Wear suitable protective clothing, gloves and eye/face protection.
Respiratory protection : In case of inadequate ventilation wear respiratory protection. Approved supplied air respirator.
Environmental exposure controls : Avoid release to the environment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

The properties listed below are for the solvent, the main component of this mixture.

Physical state : Liquid
Appearance : Liquid
Molecular mass : 32.04 g/mol
Color : Colorless
Odor : Pungent
Odor threshold : No data available
pH : No data available
Relative evaporation rate (butyl acetate=1) : No data available
Melting point : -98 °C (-144 °F)
Freezing point : No data available
Boiling point : 64.7 °C (148.5 °F)
Flash point : 9.7 °C (49.5 °F) - closed cup
Auto-ignition temperature : 455 °C (851 °F) at 1,013 hPa (760 mmHg)
Decomposition temperature : No data available
Flammability (solid, gas) : No data available
Vapor pressure : 130.3 hPa (97.7 mmHg) at 20 °C (68 °F); 169.27 hPa (126.96 mmHg) at 25 °C (77 °F)
Vapor pressure at 50 °C : 546.6 hPa (410 mmHg) at 50 °C (122 °F)
Relative vapor density at 20 °C : 1.11
Relative density : No data available
Specific gravity / density : 0.791 g/ml at 25 °C (77 °F)
Solubility : Water: Completely miscible
Log Pow : -0.77
Log Kow : No data available
Viscosity, kinematic : No data available
Viscosity, dynamic : No data available
Explosive properties : Product is not explosive.
Oxidizing properties : Non oxidizing material according to EC criteria.
Explosion limits : 6 - 36 % (V)

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Vapors may form flammable mixture with air. Highly flammable liquid and vapor.

10.2. Chemical stability

See storage and expiration date on CoA.

10.3. Possibility of hazardous reactions

No dangerous reactions known under normal conditions of use.

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10.4. Conditions to avoid

Avoid contact with hot surfaces. Heat. No flames, no sparks. Eliminate all sources of ignition.

10.5. Incompatible materials

Acid anhydrides. Acid chlorides. Oxidizing agent. Alkali Metal Amides. Reducing agents. Acids.

10.6. Hazardous decomposition products

Carbon oxides (CO, CO₂).

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Oral: Toxic if swallowed. Dermal: Toxic in contact with skin. Inhalation: Toxic if inhaled.

N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL	
LD50 oral rat	1187 - 2769 mg/kg
LD50 dermal rabbit	17100 mg/kg
LC50 inhalation rat (mg/l)	128.2 mg/l/4h ; 87.6 mg/l - 6 h
ATE CLP (oral)	100.000 mg/kg body weight
ATE CLP (dermal)	300.000 mg/kg body weight
ATE CLP (vapors)	3.000 mg/l/4h
ATE CLP (dust, mist)	128.200 mg/l/4h
LDLO, oral, human	143 mg/kg Remarks: Lungs, Thorax, or Respiration: Dyspnea. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

100% METHANOL UNLABELED (67-56-1)	
LD50 oral rat	1187 - 2769 mg/kg
LD50 dermal rabbit	17100 mg/kg
LC50 inhalation rat (mg/l)	128.2 mg/l/4h ; 87.6 mg/l - 6 h
ATE CLP (oral)	100.000 mg/kg body weight
ATE CLP (dermal)	300.000 mg/kg body weight
ATE CLP (vapors)	3.000 mg/l/4h
ATE CLP (dust, mist)	128.200 mg/l/4h
LDLO, oral, human	143 mg/kg Remarks: Lungs, Thorax, or Respiration: Dyspnea. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Skin corrosion/irritation	: Skin. Rabbit. Result: No skin irritation
Serious eye damage/irritation	: Eyes. Rabbit. Result: No eye irritation
Respiratory or skin sensitization	: Maximisation Test . Guinea pig. Did not cause sensitization. (OECD 406 method)
Germ cell mutagenicity	: AMES test : S. typhimurium. Result: negative. fibroblast. Result: Negative. Mutation in mammalian somatic cells. Mutagenicity (in vivo mammalian bone-marrow cystogenetic test, chromosomal analysis) - Mouse - male and female Result: negative. Mouse - male and female. Result: Negative
Carcinogenicity	: Not classified
Reproductive toxicity	: Damage to fetus not classifiable. Fertility classification not possible from current data.
Specific target organ toxicity – single exposure	: Causes damage to organs through prolonged or repeated exposure Causes damage to organs
Specific target organ toxicity – repeated exposure	: The substance or mixture is not classified as specific target organ toxicant, repeated exposure. No data available
Aspiration hazard	: No aspiration toxicity classification.
Potential Adverse human health effects and symptoms	: This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product. Effects due to Ingestion may include: Headache. Dizziness. Drowsiness. metabolic acidosis. Coma. May be fatal if swallowed and enters airways. If swallowed there is a risk of blindness. Effects on humans. stomach.
Symptoms/effects after inhalation	: Toxic if inhaled.
Symptoms/effects after skin contact	: Toxic in contact with skin. Causes skin irritation.
Symptoms/effects after eye contact	: Causes serious eye irritation.
Symptoms/effects after ingestion	: Toxic if swallowed.

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SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : The product is not considered harmful to aquatic organisms or to cause long-term adverse effects in the environment.

N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL	
LC50 fish 1	15400 mg/l mortality LC50 - Lepomis macrochirus (Bluegill) - 96 h
EC50 Daphnia 1	> 10000 mg/l Daphnia magna (Water flea) - 48 h
EC50 Daphnia 2	22000 mg/l Growth inhibition EC50 - Scenedesmus capricornutum (fresh water algae) - 96 h
NOEC (acute)	7900 mg/l Oryzias latipes - 200 h

100% METHANOL UNLABELED (67-56-1)	
LC50 fish 1	15400 mg/l mortality LC50 - Lepomis macrochirus (Bluegill) - 96 h
EC50 Daphnia 1	> 10000 mg/l Daphnia magna (Water flea) - 48 h
EC50 Daphnia 2	22000 mg/l Growth inhibition EC50 - Scenedesmus capricornutum (fresh water algae) - 96 h
NOEC (acute)	7900 mg/l Oryzias latipes - 200 h

12.2. Persistence and degradability

N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL	
Biochemical oxygen demand (BOD)	600 - 1200 mg/g
Chemical oxygen demand (COD)	1420 mg/g
ThOD	1500 mg/g
Biodegradation	72 % - rapidly biodegradable aerobic - Exposure time 5 d

100% METHANOL UNLABELED (67-56-1)	
Biochemical oxygen demand (BOD)	600 - 1200 mg/g
Chemical oxygen demand (COD)	1420 mg/g
ThOD	1500 mg/g
Biodegradation	72 % - rapidly biodegradable aerobic - Exposure time 5 d

12.3. Bioaccumulative potential

N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL	
BCF fish 1	5 mg/l Cyprinus carpio (Carp) - 72 d at 20 °C
Bioconcentration factor (BCF REACH)	1
Log Pow	-0.77

100% METHANOL UNLABELED (67-56-1)	
BCF fish 1	5 mg/l Cyprinus carpio (Carp) - 72 d at 20 °C
Bioconcentration factor (BCF REACH)	1
Log Pow	-0.77

12.4. Mobility in soil

N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL	
Ecology - soil	Not degradable in the soil.

100% METHANOL UNLABELED (67-56-1)	
Ecology - soil	Not degradable in the soil.

12.5. Results of PBT and vPvB assessment

N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL	
PBT: not relevant – no registration required	

100% METHANOL UNLABELED (67-56-1)	
PBT: not relevant – no registration required	

12.6. Other adverse effects

Other adverse effects : Avoid release to the environment.
Other information : Stability in water: at 19 °C - (83 - 91%) - 72 h. Remarks: Hydrolyses on contact with water. Hydrolyses readily.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Regional legislation (waste) : Waste materials should be disposed of under conditions which meet Federal, State, and local environmental control regulations.

Product/Packaging disposal recommendations : Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL

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Ecology - waste materials : Dispose of as unused product.

SECTION 14: Transport information

In accordance with ADR / RID / IMDG / IATA / ADN

14.1. UN number

UN-No.(DOT) : 1230
DOT NA no. UN1230

14.2. UN proper shipping name

Proper Shipping Name (DOT) : Methanol
Class (DOT) : 3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120
Hazard labels (DOT) : 3 - Flammable liquid
6.1 - Poison



DOT Symbols : + - Fixes (cannot be altered) proper shipping name, hazard class, and packing group, I - Proper shipping name appropriate for international and domestic transportation

Packing group (DOT) : II - Medium Danger

DOT Special Provisions (49 CFR 172.102) : IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). 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.

T7 - 4 178.274(d)(2) Normal..... 178.275(d)(3)
TP2 - a. The maximum degree of filling must not exceed the degree of filling determined by the following: (image) Where: tr is the maximum mean bulk temperature during transport, tf is the temperature in degrees celsius of the liquid during filling, and a is the mean coefficient of cubical expansion of the liquid between the mean temperature of the liquid during filling (tf) and the maximum mean bulk temperature during transportation (tr) both in degrees celsius. b. For liquids transported under ambient conditions may be calculated using the formula: (image) Where: d15 and d50 are the densities (in units of mass per unit volume) of the liquid at 15 C (59 F) and 50 C (122 F), respectively.

DOT Packaging Exceptions (49 CFR 173.xxx) : 150

DOT Packaging Non Bulk (49 CFR 173.xxx) : 202

DOT Packaging Bulk (49 CFR 173.xxx) : 242

14.3. Additional information

Emergency Response Guide (ERG) Number : 131

Other information : No supplementary information available.

Overland transport

Hazard identification number (Kemler No.) : 336

Orange plates :



Tunnel restriction code (ADR) : D/E

Limited quantities (ADR) : 1I

Excepted quantities (ADR) : E2

Transport by sea

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.

DOT Vessel Stowage Other : 40 - Stow "clear of living quarters"

MFAG-No : 131

N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL

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Air transport

DOT Quantity Limitations Passenger aircraft/rail : 1 L
(49 CFR 173.27)

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 60 L

Civil Aeronautics Law : Flammable liquids

14.4. Environmental hazards

Other information : No supplementary information available.

14.5. Special precautions for user

14.6. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

SECTION 15: Regulatory information

15.1. US Federal regulations

N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL

Listed on the United States TSCA (Toxic Substances Control Act) inventory

CERCLA RQ	5000 lb
-----------	---------

SARA Section 302 Threshold Planning Quantity (TPQ)	Not subject to reporting requirements of the United States SARA Section 302.
--	--

SARA Section 311/312 Hazard Classes	Fire hazard Immediate (acute) health hazard Delayed (chronic) health hazard
-------------------------------------	---

SARA Section 313 - Emission Reporting	Subject to reporting requirements of United States SARA Section 313
---------------------------------------	---

N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) (2991-50-6 (Unlabeled))

SARA Section 302 Threshold Planning Quantity (TPQ)	Not subject to reporting requirements of the United States SARA Section 302.
--	--

SARA Section 313 - Emission Reporting	Not subject to reporting requirements of the United States SARA Section 313.
---------------------------------------	--

100% METHANOL UNLABELED (67-56-1)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

CERCLA RQ	5000 lb
-----------	---------

SARA Section 302 Threshold Planning Quantity (TPQ)	Not subject to reporting requirements of the United States SARA Section 302.
--	--

SARA Section 311/312 Hazard Classes	Fire hazard Immediate (acute) health hazard Delayed (chronic) health hazard
-------------------------------------	---

SARA Section 313 - Emission Reporting	Subject to reporting requirements of United States SARA Section 313
---------------------------------------	---

15.2. International regulations

CANADA

N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL

Listed on the Canadian DSL (Domestic Substances List)

100% METHANOL UNLABELED (67-56-1)

Listed on the Canadian DSL (Domestic Substances List)

15.2.1. National regulations

No additional information available

15.3. US State regulations

N-ETHYLPERFLUOROOCETANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL

U.S. - California - Proposition 65 - Carcinogens List	No
---	----

U.S. - California - Proposition 65 - Developmental Toxicity	Yes
---	-----

U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
---	----

U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No
---	----

N-ETHYLPERFLUOROCTANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL

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N-ETHYLPERFLUOROCTANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL				
State or local regulations		U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Acceptable Ambient Concentrations U.S. - Massachusetts - Right To Know List U.S. - Pennsylvania - RTK (Right to Know) List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - New York - Reporting of Releases Part 597 - List of Hazardous Substances		
N-ETHYLPERFLUOROCTANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) (2991-50-6 (Unlabeled))				
U.S. - California - Proposition 65 - Carcinogens List	U.S. - California - Proposition 65 - Developmental Toxicity	U.S. - California - Proposition 65 - Reproductive Toxicity - Female	U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No significant risk level (NSRL)
No	No	No	No	
100% METHANOL UNLABELED (67-56-1)				
U.S. - California - Proposition 65 - Carcinogens List	U.S. - California - Proposition 65 - Developmental Toxicity	U.S. - California - Proposition 65 - Reproductive Toxicity - Female	U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No significant risk level (NSRL)
No	Yes	No	No	
N-ETHYLPERFLUOROCTANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) (2991-50-6 (Unlabeled))				
State or local regulations				
U.S. - Pennsylvania - RTK (Right to Know) List U.S. - New Jersey - Right to Know Hazardous Substance List				
100% METHANOL UNLABELED (67-56-1)				
State or local regulations				
U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Acceptable Ambient Concentrations U.S. - Massachusetts - Right To Know List U.S. - Pennsylvania - RTK (Right to Know) List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - New York - Reporting of Releases Part 597 - List of Hazardous Substances				

SECTION 16: Other information

Other information : This product is not radioactive. The data given for this product are those of the corresponding unlabeled compound, unless specifically indicated otherwise. Health and safety data for labeled compounds are generally not available, but are assumed to be similar or identical to the corresponding unlabeled compound.

Full text of R-, H- and EUH-phrases:

Acute Tox. 3 (Dermal)	Acute toxicity (dermal) Category 3
Acute Tox. 3 (Inhalation)	Acute toxicity (inhalation) Category 3
Acute Tox. 3 (Inhalation:vapour)	Acute toxicity (inhalation:vapour) Category 3
Acute Tox. 3 (Oral)	Acute toxicity (oral) Category 3
Eye Irrit. 2	Serious eye damage/eye irritation Category 2
Flam. Liq. 2	Flammable liquids Category 2
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT SE 1	Specific target organ toxicity (single exposure) Category 1
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H225	Highly flammable liquid and vapor
H301	Toxic if swallowed
H311	Toxic in contact with skin
H315	Causes skin irritation
H319	Causes serious eye irritation
H331	Toxic if inhaled
H335	May cause respiratory irritation
H370	Causes damage to organs
R11	Highly flammable
R36/37/38	Irritating to eyes, respiratory system and skin
R36/38	Irritating to eyes and skin
R39/23/24/25	Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed

N-ETHYLPERFLUOROOCATANESULFONAMIDOACETIC ACID (N-ETHYL-D5, 98%) 50 UG/ML IN METHANOL

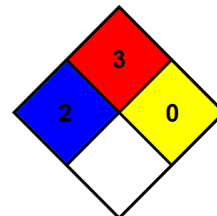
DLM-10664-S

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830 and according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

F	Highly flammable
T	Toxic
Xi	Irritant

- NFPA health hazard : 2 - Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.
- NFPA fire hazard : 3 - Liquids and solids (including finely divided suspended solids) that can be ignited under almost all ambient temperature conditions.
- NFPA reactivity : 0 - Material that in themselves are normally stable, even under fire conditions.



Hazard Rating

- Health : 2 Moderate Hazard - Temporary or minor injury may occur
- Flammability : 3 Serious Hazard
- Physical : 0 Minimal Hazard

CIL Mixture SDS

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Mercury

Product Number : 215457
Brand : Sigma-Aldrich
Index-No. : 080-001-00-0

CAS-No. : 7439-97-6

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Inhalation (Category 2), H330
Reproductive toxicity (Category 1B), H360
Specific target organ toxicity - repeated exposure (Category 1), H372
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H330 Fatal if inhaled.
H360 May damage fertility or the unborn child.
H372 Causes damage to organs through prolonged or repeated exposure.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.

P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284	Wear respiratory protection.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: Hg
Molecular weight	: 200.59 g/mol
CAS-No.	: 7439-97-6
EC-No.	: 231-106-7
Index-No.	: 080-001-00-0

Hazardous components

Component	Classification	Concentration
Mercury		
	Acute Tox. 2; Repr. 1B; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H330, H360, H372, H410	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal. In some instances, a mercury spill kit may be used. Please consult with your site EHS representative to determine the most appropriate clean up method. Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Store under inert gas.

Storage class (TRGS 510): 6.1B: Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Mercury	7439-97-6	C	0.1 mg/m ³	USA. NIOSH Recommended Exposure Limits
	Remarks	Potential for dermal absorption		
		CEIL	1.0mg/10m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		TWA	0.05 mg/m ³	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		

		TWA	0.025 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Kidney damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	0.05 mg/m ³	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---------------|---------------------------------------|
| a) Appearance | Form: liquid
Colour: silver, white |
|---------------|---------------------------------------|

b) Odour	odourless
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: -38.87 °C (-37.97 °F) - lit.
f) Initial boiling point and boiling range	356.6 °C (673.9 °F) - lit.
g) Flash point	Not applicable
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	< 0.01 hPa (< 0.01 mmHg) at 20 °C (68 °F) 1 hPa (1 mmHg) at 126 °C (259 °F)
l) Vapour density	6.93 - (Air = 1.0)
m) Relative density	13.55 g/cm ³ at 25 °C (77 °F)
n) Water solubility	0.00006 g/l at 25 °C (77 °F)
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

Relative vapour density 6.93 - (Air = 1.0)

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, Ammonia, Azides, Nitrates, Chlorates, Copper

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Mercury/mercury oxides.

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

LC50 Inhalation - Rat - male - 2 h - < 27 mg/m³

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

Presumed human reproductive toxicant

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard

No data available

Additional Information

RTECS: OV4550000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish mortality LC50 - Cyprinus carpio (Carp) - 0.160 mg/l - 96 h

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Bioaccumulation Carassius auratus (goldfish) - 1,789 d
- 0.25 µg/l

Bioconcentration factor (BCF): 155,986

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2809 Class: 8 (6.1) Packing group: III
Proper shipping name: A. W. Mercury
Reportable Quantity (RQ): 1 lbs
Poison Inhalation Hazard: No

IMDG

IATA

UN number: 2809 Class: 8 (6.1) Packing group: III
Proper shipping name: Mercury

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Mercury	7439-97-6	2015-11-23

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Mercury	7439-97-6	2015-11-23

	CAS-No.	Revision Date
Mercury	7439-97-6	2015-11-23

New Jersey Right To Know Components

	CAS-No.	Revision Date
Mercury	7439-97-6	2015-11-23

California Prop. 65 Components

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.
Mercury

CAS-No.
7439-97-6

Revision Date
2013-12-20

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H330	Fatal if inhaled.
H360	May damage fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
Repr.	Reproductive toxicity

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.15

Revision Date: 03/05/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 4.12
Revision Date 09/23/2016
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Nitrobenzene

Product Number : 48547
Brand : Supelco
Index-No. : 609-003-00-7

CAS-No. : 98-95-3

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 4), H227
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 3), H331
Acute toxicity, Dermal (Category 3), H311
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 1B), H360
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), Blood, H372
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H227 : Combustible liquid.
H301 + H311 + H331 : Toxic if swallowed, in contact with skin or if inhaled
H351 : Suspected of causing cancer.
H360 : May damage fertility or the unborn child.
H372 : Causes damage to organs (Blood) through prolonged or repeated

H412	exposure if inhaled. Harmful to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

Rapidly absorbed through skin.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₆ H ₅ NO ₂
Molecular weight	: 123.11 g/mol
CAS-No.	: 98-95-3
EC-No.	: 202-716-0
Index-No.	: 609-003-00-7

Hazardous components

Component	Classification	Concentration
Nitrobenzene Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)		
	Flam. Liq. 4; Acute Tox. 3; Carc. 2; Repr. 1B; STOT RE 1; Aquatic Acute 3; Aquatic Chronic 3; H227, H301 + H311 + H331, H351, H360, H372, H412	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations.

Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Nitrobenzene	98-95-3	TWA	1.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Methemoglobinemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	1 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Methemoglobinemia Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	1.000000 ppm 5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation The value in mg/m3 is approximate.		
		TWA	1.000000 ppm 5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		PEL	1 ppm 5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Nitrobenzene	98-95-3	Total p-nitrophenol	5mg/g Creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		Methemoglobin	1.5% Hb	In blood	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		Methemoglobin	1.5% Hb	In blood	ACGIH - Biological Exposure Indices (BEI)
		During or at the end of the shift			

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 480 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact

Material: Nature latex/chloroprene

Minimum layer thickness: 0.6 mm

Break through time: 40 min

Material tested: Lapren® (KCL 706 / Aldrich Z677558, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: liquid, clear
Colour: colourless, yellow |
| b) Odour | pungent |
| c) Odour Threshold | No data available |
| d) pH | 8.0 - 8.5 at 1.00000 g/l at 20.0 °C (68.0 °F) |
| e) Melting point/freezing point | Melting point/range: 5 - 6 °C (41 - 43 °F) - lit. |
| f) Initial boiling point and boiling range | 210 - 211 °C (410 - 412 °F) - lit. |
| g) Flash point | 88.0 °C (190.4 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 40 %(V)
Lower explosion limit: 1.8 %(V) |
| k) Vapour pressure | 66.7 hPa (50.0 mmHg) at 120.0 °C (248.0 °F)
0.3 hPa (0.2 mmHg) at 20.0 °C (68.0 °F) |
| l) Vapour density | No data available |

m) Relative density	1.196 g/cm ³ at 25 °C (77 °F)
n) Water solubility	1.9 g/l at 20 °C (68 °F)
o) Partition coefficient: n-octanol/water	log Pow: 1.86 at 24.5 °C (76.1 °F)
p) Auto-ignition temperature	482.0 °C (899.6 °F)
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety information

Surface tension	43.4 mN/m at 20.0 °C (68.0 °F)
-----------------	--------------------------------

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents, Strong reducing agents, Strong bases

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Nitrogen oxides (NO_x)

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male - 588 mg/kg

LC50 Inhalation - Rat - 4 h - 556 ppm

Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Lacrimation. Behavioral:Tremor. Cyanosis

LD50 Dermal - Rabbit - 760 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation - 24 h

Serious eye damage/eye irritation

Eyes - Rabbit

Result: No eye irritation

Respiratory or skin sensitisation

- Mouse

Result: Did not cause sensitisation on laboratory animals.
(OECD Test Guideline 429)

Germ cell mutagenicity

unscheduled DNA synthesis assay
rat hepatocytes
Result: negative

OECD Test Guideline 474

Mouse - male and female

Result: negative

Carcinogenicity

Suspected human carcinogens

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Nitrobenzene)

NTP: Reasonably anticipated to be a human carcinogen (Nitrobenzene)

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

Presumed human reproductive toxicant

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Inhalation - Causes damage to organs through prolonged or repeated exposure. - Blood

Inhalation - Blood

Aspiration hazard

No data available

Additional Information

Repeated dose toxicity Rat - male and female - Oral - 28 d - LOAEL : 5 mg/kg

Rat - male and female - Inhalation - 14 d - NOAEL : 0.625 mg/l - LOAEL : < 0.05 mg/l - OECD Test Guideline 412

RTECS: DA6475000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated., Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed 2 to 4 hours or longer., Exposure to and/or consumption of alcohol may increase toxic effects.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish flow-through test LC50 - Danio rerio (zebra fish) - 92 mg/l - 96.0 h
(OECD Test Guideline 203)

Toxicity to daphnia and other aquatic invertebrates static test EC50 - Daphnia magna (Water flea) - 35 mg/l - 48 h

Toxicity to algae Growth inhibition EC50 - Chlorella pyrenoidosa - 18 mg/l - 96 h
(OECD Test Guideline 201)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 14 d
Result: 3.3 % - Not readily biodegradable.

(OECD Test Guideline 301C)

12.3 Bioaccumulative potential

Bioaccumulation Cyprinus carpio (Carp) - 42 d
at 25 °C - 0.125 mg/l

Bioconcentration factor (BCF): 3.1 - 4.8
(OECD Test Guideline 305C)

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1662 Class: 6.1 Packing group: II
Proper shipping name: Nitrobenzene
Reportable Quantity (RQ): 1000 lbs
Marine pollutant:yes
Poison Inhalation Hazard: No

IMDG

UN number: 1662 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: NITROBENZENE
Marine pollutant:yes

IATA

UN number: 1662 Class: 6.1 Packing group: II
Proper shipping name: Nitrobenzene

15. REGULATORY INFORMATION

SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Nitrobenzene	98-95-3	2007-07-01

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Nitrobenzene	98-95-3	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

CAS-No.	Revision Date
---------	---------------

Nitrobenzene	98-95-3	2007-07-01
Pennsylvania Right To Know Components		
Nitrobenzene	CAS-No. 98-95-3	Revision Date 2007-07-01
New Jersey Right To Know Components		
Nitrobenzene	CAS-No. 98-95-3	Revision Date 2007-07-01
California Prop. 65 Components		
WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No. 98-95-3	Revision Date 2010-06-11
Nitrobenzene		
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.	CAS-No. 98-95-3	Revision Date 2010-06-11
Nitrobenzene		

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
Flam. Liq.	Flammable liquids
H227	Combustible liquid.
H301	Toxic if swallowed.
H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled
H311	Toxic in contact with skin.
H331	Toxic if inhaled.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	2
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	2
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

SAFETY DATA SHEET

Version 6.1
Revision Date 07/17/2018
Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : **N-Nitrosodi-n-propylamine**
Product Number : 48554
Brand : Supelco
Index-No. : 612-098-00-8
CAS-No. : 621-64-7

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 Street
ST. LOUIS MO 63103
UNITED STATES
Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

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

Carcinogenicity (Category 1B), H350

Acute aquatic toxicity (Category 2), H401

Chronic aquatic toxicity (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H302

Harmful if swallowed.

H350

May cause cancer.

H411	Toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C6H14N2O
Molecular weight	: 130.22 g/mol
CAS-No.	: 621-64-7
EC-No.	: 210-698-0
Index-No.	: 612-098-00-8

Hazardous components

Component	Classification	Concentration
N-Nitroso dipropylamine	Acute Tox. 4; Carc. 1B; Aquatic Acute 2; Aquatic Chronic 2; H302, H350, H411	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Nitrogen oxides (NOx)

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Store at room temperature.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES**9.1 Information on basic physical and chemical properties**

- | | |
|---|------------------------|
| a) Appearance | Form: liquid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | No data available |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | 0.92 g/cm ³ |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | log Pow: 1.36 |
| p) Auto-ignition 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

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

copper salts, mercury salts, Strong mineral acids, Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Nitrogen oxides (NOx)

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 480.0 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (N-Nitroso dipropylamine)

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: RAHC - Reasonably anticipated to be a human carcinogen (N-Nitroso dipropylamine)

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: JL9700000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Lungs -

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(N-Nitroso dipropylamine)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (N-Nitroso dipropylamine)
Reportable Quantity (RQ) : 10 lbs

no

Poison Inhalation Hazard: No

IMDG

UN number: 3082 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (N-Nitroso dipropylamine)

IATA

UN number: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (N-Nitroso dipropylamine)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION**SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
N-Nitroso dipropylamine	621-64-7	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. N-Nitroso dipropylamine	621-64-7	2007-09-28

16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

H302	Harmful if swallowed.
H350	May cause cancer.
H401	Toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.

Further information

Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1

Revision Date: 07/17/2018

Print Date: 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : N-Nitrosodiphenylamine

Product Number : N5882

Brand : Sigma

CAS-No. : 86-30-6

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 aquatic toxicity (Category 2), H401

Chronic aquatic toxicity (Category 2), H411

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

Warning

Hazard statement(s)

H302

Harmful if swallowed.

H411

Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P264

Wash skin thoroughly after handling.

P270

Do not eat, drink or smoke when using this product.

P273

Avoid release to the environment.

P301 + P312

IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.

P330

Rinse mouth.

P391

Collect spillage.

P501

Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : Diphenylnitrosamine
Diphenylnitrosoamine
N-Nitroso-N-phenylaniline

Formula : C₁₂H₁₀N₂O
Molecular weight : 198.22 g/mol
CAS-No. : 86-30-6
EC-No. : 201-663-0

Hazardous components

Component	Classification	Concentration
N-Nitrosodiphenylamine		
	Acute Tox. 4; Aquatic Acute 2; Aquatic Chronic 2; H302, H411	-

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: powder |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 65 - 66 °C (149 - 151 °F) |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | No data available |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | log Pow: 3.13 |
| p) Auto-ignition 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

Solubility in other solvents

Methanol 100 g/l - soluble

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Nitrogen oxides (NOx)

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 1,825 mg/kg

Remarks: Cyanosis

Inhalation: No data available

LD50 Dermal - Rabbit - > 7,940 mg/kg

Remarks: Behavioral:Food intake (animal). Behavioral:Change in motor activity (specific assay).

No data available

Skin corrosion/irritation

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Mild eye irritation - 24 h

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.

Carcinogenicity

Carcinogenicity - Rat - Oral

Tumorigenic:Carcinogenic by RTECS criteria. Kidney, Ureter, Bladder:Tumors.

Carcinogenicity - Mouse - Skin

Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Lungs, Thorax, or Respiration:Bronchiogenic carcinoma.

Tumorigenic:Increased incidence of tumors in susceptible strains.

Carcinogenicity - Rat - Oral

Tumorigenic:Carcinogenic by RTECS criteria. Kidney, Ureter, Bladder:Tumors. Skin and Appendages: Other: Tumors.

Carcinogenicity - Rat - Intraperitoneal

Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Liver:Tumors. Endocrine:Tumors.

Carcinogenicity - Mouse - Oral

Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Kidney, Ureter, Bladder:Tumors.

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification. Nitrosamines are suspected of causing cancers of the lung, nasal sinuses, brain, esophagus, stomach, liver, bladder, and kidney.

- IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
- IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (N-Nitrosodiphenylamine)
No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
- ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
- NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
- OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: JJ9800000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Bladder -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - *Lepomis macrochirus* (Bluegill) - 5.8 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates LC50 - *Daphnia magna* (Water flea) - 7.8 mg/l - 48 h

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation *Lepomis macrochirus* (Bluegill) - 14 d
- 0.00921 mg/l

Bioconcentration factor (BCF): 217

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (N-Nitrosodiphenylamine)
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG

Not dangerous goods

IATA

Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
N-Nitrosodiphenylamine	86-30-6	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
N-Nitrosodiphenylamine	86-30-6	2007-07-01

	CAS-No.	Revision Date
N-Nitrosodiphenylamine	86-30-6	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
N-Nitrosodiphenylamine	86-30-6	2007-07-01

	CAS-No.	Revision Date
N-Nitrosodiphenylamine	86-30-6	2007-07-01

	CAS-No.	Revision Date
N-Nitrosodiphenylamine	86-30-6	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
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N-Nitrosodiphenylamine

86-30-6

2007-07-01

N-Nitrosodiphenylamine

CAS-No.
86-30-6

Revision Date
2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.
N-Nitrosodiphenylamine

CAS-No.
86-30-6

Revision Date
2007-09-28

WARNING! This product contains a chemical known to the State of California to cause cancer.
N-Nitrosodiphenylamine

CAS-No.
86-30-6

Revision Date
2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H302	Harmful if swallowed.
H401	Toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.9

Revision Date: 12/11/2017

Print Date: 07/17/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 05/26/2018
Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Pentachlorophenol

Product Number : P2604
Brand : Aldrich
Index-No. : 604-002-00-8

CAS-No. : 87-86-5

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

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 3), H301

Acute toxicity, Inhalation (Category 2), H330

Acute toxicity, Dermal (Category 3), H311

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Carcinogenicity (Category 2), H351

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301 + H311

Toxic if swallowed or in contact with skin.

H315

Causes skin irritation.

H319

Causes serious eye irritation.

H330

Fatal if inhaled.

H335

May cause respiratory irritation.

H351

Suspected of causing cancer.

H400

Very toxic to aquatic life.

H411

Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P260

Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.

P264

Wash skin thoroughly after handling.

P270

Do not eat, drink or smoke when using this product.

P271

Use only outdoors or in a well-ventilated area.

P273

Avoid release to the environment.

P280

Wear protective gloves/ protective clothing/ eye protection/ face protection.

P284

Wear respiratory protection.

P301 + P310 + P330

IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.

P302 + P352 + P312

IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.

P304 + P340 + P310

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.

P305 + P351 + P338

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P332 + P313

If skin irritation occurs: Get medical advice/ attention.

P337 + P313

If eye irritation persists: Get medical advice/ attention.

P362

Take off contaminated clothing and wash before reuse.

P391

Collect spillage.

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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Molecular weight	:	266.34 g/mol
CAS-No.	:	87-86-5
EC-No.	:	201-778-6
Index-No.	:	604-002-00-8

Hazardous components

Component	Classification	Concentration
Pentachlorophenol		
	Acute Tox. 3; Acute Tox. 2;	<= 100 %

	Acute Tox. 3; Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; STOT SE 3; Aquatic Acute 1; Aquatic Chronic 2; H301 + H311, H315, H319, H330, H335, H351, H400, H411	
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For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): 6.1B: Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Pentachlorophenol	87-86-5	TWA	0.5 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Cardiac impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		STEL	1 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Cardiac impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.5 mg/m ³	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		TWA	0.5 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		PEL	0.5 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Pentachlorophenol	87-86-5	pentachlorophenol		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Prior to last shift of workweek			

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 120 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: crystalline
Colour: light red |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 165 - 180 °C (329 - 356 °F) |
| f) Initial boiling point and boiling range | 310 °C (590 °F) |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 53.3 hPa at 211.2 °C (412.2 °F) |

- | | |
|---|-----------------------------|
| l) Vapour density | No data available |
| m) Relative density | 1.978 g/mL at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | log Pow: 5.12 |
| p) Auto-ignition 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

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, Strong bases

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 27 mg/kg

Remarks: Vascular:BP elevation not characterized in autonomic section. Endocrine:Hyperglycemia. Nutritional and Gross Metabolic:Changes in:Body temperature increase.

LC50 Inhalation - Rat - 355 mg/m³

Remarks: Behavioral:Excitement. Behavioral:Muscle contraction or spasticity. Lungs, Thorax, or Respiration:Dyspnea.

LD50 Dermal - Rat - 96.0 mg/kg

Remarks: Behavioral:Excitement. Behavioral:Muscle contraction or spasticity. Lungs, Thorax, or Respiration:Dyspnea.

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Open irritation test - 24.00 h

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Mild eye irritation - 24.00 h

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

The evidence for carcinogenicity of pentachlorophenol (PCP) is based on assays that utilized less than pure PCP. Contaminants of PCP include: tri- or tetra- chlorophenol, hexachlorobenzene, polychlorinated dibenzo-p-dioxins, or polychlorinated dibenzofurans. Indications are that positive evidence for carcinogenicity is from the contaminant(s) and not the PCP. This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC: 1 - Group 1: Carcinogenic to humans (Pentachlorophenol)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Pentachlorophenol)

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

No data available

Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Specific target organ toxicity - single exposure

May cause respiratory irritation.

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

Convulsions

Kidney -

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish	LC50 - Cyprinodon variegatus (sheepshead minnow) - 0.16 - 0.5 mg/l - 96.0 h(Pentachlorophenol)
	LC50 - Carassius auratus (goldfish) - 0.16 - 0.38 mg/l - 96.0 h(Pentachlorophenol)
	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.075 mg/l - 96.0 h(Pentachlorophenol)
	NOEC - other fish - 0.01 mg/l - 24.0 h(Pentachlorophenol)
	LOEC - other fish - 0.1 mg/l - 24.0 h(Pentachlorophenol)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 0.30 - 1.30 mg/l - 48 h(Pentachlorophenol)
Toxicity to algae	EC50 - No information available. - 0.36 mg/l - 10 d(Pentachlorophenol)
	EC50 - Chlorella vulgaris (Fresh water algae) - 10.30 mg/l - 96 h(Pentachlorophenol)
	Growth inhibition EC50 - Scenedesmus quadricauda (Green algae) - 0.08 mg/l - 96 h(Pentachlorophenol)

12.2 Persistence and degradability

Biodegradability Result: 99 % - Biodegradable

12.3 Bioaccumulative potential

Bioaccumulation Oncorhynchus mykiss (rainbow trout) - 144 h
- 0.0912 mg/l(Pentachlorophenol)

Bioconcentration factor (BCF): 482

12.4 Mobility in soil

No data available(Pentachlorophenol)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3155 Class: 6.1 Packing group: II
Proper shipping name: Pentachlorophenol
Reportable Quantity (RQ) : 10 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 3155 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: PENTACHLOROPHENOL
Marine pollutant : yes

IATA

UN number: 3155 Class: 6.1 Packing group: II
Proper shipping name: Pentachlorophenol

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

Pentachlorophenol	CAS-No. 87-86-5	Revision Date 2007-07-01
Pennsylvania Right To Know Components		
Pentachlorophenol	CAS-No. 87-86-5	Revision Date 2007-07-01
New Jersey Right To Know Components		
Pentachlorophenol	CAS-No. 87-86-5	Revision Date 2007-07-01
California Prop. 65 Components		
WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No. 87-86-5	Revision Date 2007-09-28
Pentachlorophenol		

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H301	Toxic if swallowed.
H301 + H311	Toxic if swallowed or in contact with skin.
H311	Toxic in contact with skin.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H330	Fatal if inhaled.
H335	May cause respiratory irritation.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	1

NFPA Rating

Health hazard:	4
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 05/26/2018

Print Date: 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Heptafluorobutyric acid

Product Number : 52411
Brand : Sigma-Aldrich

CAS-No. : 375-22-4

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 sheetCompany : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USATelephone : +1 800-325-5832
Fax : +1 800-325-5052**1.4 Emergency telephone number**

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Skin corrosion (Category 1A), H314

Serious eye damage (Category 1), H318

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H314

Causes severe skin burns and eye damage.

Precautionary statement(s)

P264

Wash skin thoroughly after handling.

P280

Wear protective gloves/ protective clothing/ eye protection/ face protection.

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 + P310

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.

P305 + P351 + P338 + P310

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.

P363 Wash contaminated clothing before reuse.
P405 Store locked up.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : HFBA
Perfluorobutyric acid
Edman Reagent No. 3

Formula : C₄HF₇O₂
Molecular weight : 214.04 g/mol
CAS-No. : 375-22-4
EC-No. : 206-786-3

Hazardous components

Component	Classification	Concentration
Heptafluorobutyric acid	Skin Corr. 1A; Eye Dam. 1; H314	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

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

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

hygroscopic Light sensitive. Store under inert gas. Stench.

Storage class (TRGS 510): 8B: Non-combustible, corrosive hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

Hazardous components without workplace control parameters

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 480 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 240 min
Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: liquid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | 1 |
| e) Melting point/freezing point | No data available |
| f) Initial boiling point and boiling range | 120 °C (248 °F) at 1,007 hPa (755 mmHg) - lit. |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 13 hPa (10 mmHg) at 25 °C (77 °F) |
| l) Vapour density | 7.39 - (Air = 1.0) |
| m) Relative density | 1.645 g/mL at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition 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

Relative vapour density 7.39 - (Air = 1.0)

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

Bases, Oxidizing agents, Reducing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen fluoride

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - 112 mg/kg

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: ET4025000

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Cough, Shortness of breath, Headache, Nausea

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 3265 Class: 8 Packing group: I
Proper shipping name: Corrosive liquid, acidic, organic, n.o.s. (Heptafluorobutyric acid)
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG**IATA**

UN number: 3265 Class: 8 Packing group: I
Proper shipping name: Corrosive liquid, acidic, organic, n.o.s. (Heptafluorobutyric acid)

15. REGULATORY INFORMATION**SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

Acute Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Heptafluorobutyric acid	375-22-4	

	CAS-No.	Revision Date
Heptafluorobutyric acid	375-22-4	

New Jersey Right To Know Components

	CAS-No.	Revision Date
Heptafluorobutyric acid	375-22-4	

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

Eye Dam.	Serious eye damage
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
Skin Corr.	Skin corrosion

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	3
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.4

Revision Date: 02/21/2018

Print Date: 06/22/2019



SAFETY DATA SHEET

Perfluorodecanesulfonic acid

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	Perfluorodecanesulfonic acid
Product number	FH100674
Synonyms; trade names	1,1,2,2,3,3,4,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-Henicosafluorodecane-1-sulfonic acid
CAS number	335-77-3
EC number	206-401-9

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
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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 206-401-9

Pictogram



Signal word Warning

Perfluorodecanesulfonic acid

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	Perfluorodecanesulfonic acid
CAS number	335-77-3
EC number	206-401-9
Chemical formula	C ₁₀ HF ₂₁ O ₃ 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.
-------------------------	-------------

Perfluorodecanesulfonic acid

Hazardous combustion products Thermal decomposition or combustion products may include the following substances: Oxides of carbon. 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. Hygroscopic. Store contents under inert gas. Store at temperatures not exceeding -20°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.

Perfluorodecanesulfonic acid

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	Dark. Brown.
Odour	No data available.
Odour threshold	No data available.
pH	No data available.
Melting point	No data available.
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 Acetone. 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.

Perfluorodecanesulfonic acid

9.2. Other information

Molecular weight 600.15

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 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

Perfluorodecanesulfonic acid

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

Perfluorodecanesulfonic acid

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

Perfluorodecanesulfonic acid

Not applicable.

14.7. Transport in bulk according to Annex II of MARPOL and the IBC Code

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable.

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.

Inventories

US - TSCA

Present.

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	17/10/2018
Revision	1
SDS number	144926

Perfluorodecanesulfonic acid

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. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Perfluorodecanoic acid

Product Number : 177741

Brand : Aldrich

CAS-No. : 335-76-2

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 sheetCompany : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301

Toxic if swallowed.

H315

Causes skin irritation.

H319

Causes serious eye irritation.

H335

May cause respiratory irritation.

Precautionary statement(s)

P261

Avoid breathing dust/ fume/ gas/ mist/ vapours/ 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/ eye protection/ face protection.

P301 + P310 + P330

IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse

P302 + P352
 P304 + P340 + P312
 P305 + P351 + P338
 P332 + P313
 P337 + P313
 P362
 P403 + P233
 P405
 P501

mouth.
 IF ON SKIN: Wash with plenty of soap and water.
 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 If skin irritation occurs: Get medical advice/ attention.
 If eye irritation persists: Get medical advice/ attention.
 Take off contaminated clothing and wash before reuse.
 Store in a well-ventilated place. Keep container tightly closed.
 Store locked up.
 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : Nonadecafluorodecanoic acid
 Nonadecafluorocapric acid
 Perfluorodecanoic acid
 Perfluorocapric acid

Formula : C₁₀HF₁₉O₂
 Molecular weight : 514.08 g/mol
 CAS-No. : 335-76-2
 EC-No. : 206-400-3

Hazardous components

Component	Classification	Concentration
Nonadecafluorodecanoic acid	Acute Tox. 3; Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; H301, H315, H319, H335	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods 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.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

Hazardous components without workplace control parameters

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: powder
Colour: white |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 77 - 81 °C (171 - 178 °F) - lit. |
| f) Initial boiling point and boiling range | 218 °C (424 °F) at 987 hPa (740 mmHg) - lit. |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |

- | | |
|---|-------------------|
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | No data available |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition 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

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

Bases, Oxidizing agents, Reducing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen fluoride

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 57 mg/kg

Remarks: Behavioral:Food intake (animal).

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Rat

DNA damage

Carcinogenicity

- IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
- NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
- OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

Reproductive toxicity - Rat - Oral

Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Fertility: Litter size (e.g.; # fetuses per litter; measured before birth). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Reproductive toxicity - Rat - Intraperitoneal

Paternal Effects: Testes, epididymis, sperm duct.

Reproductive toxicity - Mouse - Oral

Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Embryo or Fetus: Fetal death.

No data available

Specific target organ toxicity - single exposure

Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: HD9900000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 2811 Class: 6.1 Packing group: III
 Proper shipping name: Toxic solids, organic, n.o.s. (Nonadecafluorodecanoic acid)
 Reportable Quantity (RQ):
 Poison Inhalation Hazard: No

IMDG

UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
 Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Nonadecafluorodecanoic acid)

IATA

UN number: 2811 Class: 6.1 Packing group: III
 Proper shipping name: Toxic solid, organic, n.o.s. (Nonadecafluorodecanoic acid)

15. REGULATORY INFORMATION**SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

Acute Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Nonadecafluorodecanoic acid	335-76-2	

New Jersey Right To Know Components

	CAS-No.	Revision Date
Nonadecafluorodecanoic acid	335-76-2	

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

Acute Tox.	Acute toxicity
Eye Irrit.	Eye irritation
H301	Toxic if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
Skin Irrit.	Skin irritation
STOT SE	Specific target organ toxicity - single exposure

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard: 2
Fire Hazard: 0
Reactivity Hazard: 0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.6

Revision Date: 10/20/2017

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 3.8
Revision Date 10/20/2016
Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Perfluoroheptanoic acid

Product Number : 342041
Brand : Aldrich

CAS-No. : 375-85-9

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H302

Harmful if swallowed.

H314

Causes severe skin burns and eye damage.

Precautionary statement(s)

P260

Do not breathe dust or mist.

P264

Wash skin thoroughly after handling.

P270

Do not eat, drink or smoke when using this product.

P280

Wear protective gloves/ protective clothing/ eye protection/ face protection.

P301 + P312

IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.

P301 + P330 + P331

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P303 + P361 + P353

IF ON SKIN (or hair): Remove/ Take off immediately all contaminated

P304 + P340	clothing. Rinse skin with water/ shower. IF INHALED: Remove victim to fresh air and keep at rest in a position 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/doctor.
P321	Specific treatment (see supplemental first aid instructions on this label).
P363	Wash contaminated clothing before reuse.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₇ HF ₁₃ O ₂
Molecular weight	: 364.06 g/mol
CAS-No.	: 375-85-9
EC-No.	: 206-798-9

Hazardous components

Component	Classification	Concentration
Perfluoroheptanoic acid		
	Acute Tox. 4; Skin Corr. 1B; Eye Dam. 1; H302, H314	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

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

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance	Form: crystalline Colour: beige
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/freezing point: 30 °C (86 °F)
f) Initial boiling point and boiling range	175 °C (347 °F) at 989 hPa (742 mmHg)
g) Flash point	> 113.00 °C (> 235.40 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	1.792 g/mL at 25 °C (77 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen fluoride

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen fluoride

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: 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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3261 Class: 8 Packing group: II
Proper shipping name: Corrosive solid, acidic, organic, n.o.s. (Perfluoroheptanoic acid)

Poison Inhalation Hazard: No

IMDG

UN number: 3261 Class: 8 Packing group: II EMS-No: F-A, S-B
Proper shipping name: CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S. (Perfluoroheptanoic acid)

IATA

UN number: 3261 Class: 8 Packing group: II
Proper shipping name: Corrosive solid, acidic, organic, n.o.s. (Perfluoroheptanoic acid)

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

Acute Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Perfluoroheptanoic acid	CAS-No. 375-85-9	Revision Date
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New Jersey Right To Know Components

Perfluoroheptanoic acid	CAS-No. 375-85-9	Revision Date
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California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Eye Dam.	Serious eye damage
H302	Harmful if swallowed.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
Skin Corr.	Skin corrosion

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	3
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.8

Revision Date: 10/20/2016

Print Date: 06/22/2019



SAFETY DATA SHEET

Perfluorohexanesulfonic acid

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name	Perfluorohexanesulfonic acid
Product number	FP71520
CAS number	355-46-4
EC number	206-587-1

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	Acute Tox. 4 - H302 Acute Tox. 4 - H312 Acute Tox. 4 - H332 Skin Corr. 1B - H314 Eye Dam. 1 - H318
Environmental hazards	Not Classified

2.2. Label elements

EC number 206-587-1

Pictogram



Signal word Danger

Hazard statements H302+H312+H332 Harmful if swallowed, in contact with skin or if inhaled.
H314 Causes severe skin burns and eye damage.

Perfluorohexanesulfonic acid

Precautionary statements	P270 Do not eat, drink or smoke when using this product. P280 Wear protective gloves/ protective clothing/ eye protection/ face protection. P301+P312 IF SWALLOWED: Call a POISON CENTRE/doctor if you feel unwell. 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. P501 Dispose of contents/ container in accordance with national regulations.
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2.3. Other hazards

No data available.

SECTION 3: Composition/information on ingredients

3.1. Substances

Product name	Perfluorohexanesulfonic acid
CAS number	355-46-4
EC number	206-587-1
Chemical formula	C ₆ HF ₁₃ O ₃ 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. When breathing is difficult, properly trained personnel may assist affected person by administering oxygen. If breathing stops, provide artificial respiration. 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.
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4.3. Indication of any immediate medical attention and special treatment needed

Notes for the doctor	Treat symptomatically.
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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.
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5.2. Special hazards arising from the substance or mixture

Specific hazards	None known.
Hazardous combustion products	Thermal decomposition or combustion products may include the following substances: Harmful gases or vapours. Oxides of carbon. Oxides of sulphur. Hydrogen fluoride (HF).

Perfluorohexanesulfonic acid

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 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. Absorb spillage with sand or other inert absorbent. Clear up spills immediately and dispose of waste safely. Flush contaminated area with plenty of water. Wash thoroughly after dealing with a spillage. Provide adequate ventilation. 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 contact with skin and eyes. Avoid inhalation of 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. Protect from moisture. Store at temperatures between 2°C and 8°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.

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.

Perfluorohexanesulfonic acid

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. Gas and combination filter cartridges should comply with European Standard EN14387. 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	Liquid.
Colour	Colourless to pale yellow.
Odour	No data available.
Odour threshold	No data available.
pH	No data available.
Melting point	No data available.
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)	No data available.
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.

9.2. Other information

Molecular weight	400.12
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Perfluorohexanesulfonic acid

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 Avoid heat. Moisture.

10.5. Incompatible materials

Materials to avoid Strong oxidising agents. Strong acids.

10.6. Hazardous decomposition products

Hazardous decomposition products Oxides of carbon. Oxides of sulphur. Hydrogen fluoride (HF).

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity - oral

Notes (oral LD₅₀) Acute Tox. 4 - H302 Harmful if swallowed.

ATE oral (mg/kg) 500.0

Acute toxicity - dermal

Notes (dermal LD₅₀) Acute Tox. 4 - H312 Harmful in contact with skin.

ATE dermal (mg/kg) 1,100.0

Acute toxicity - inhalation

Notes (inhalation LC₅₀) Acute Tox. 4 - H332 Harmful if inhaled.

ATE inhalation (vapours mg/l) 11.0

Skin corrosion/irritation

Animal data Skin Corr. 1B - H314 Causes severe burns.

Serious eye damage/irritation

Serious eye damage/irritation Eye Dam. 1 - H318 Corrosive to skin. Corrosivity to eyes is assumed.

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.

Perfluorohexanesulfonic acid

Reproductive toxicity

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 Not classified as a specific target organ toxicant after a single exposure.

Specific target organ toxicity - repeated exposure

STOT - repeated exposure Not classified as a specific target organ toxicant after repeated exposure.

Aspiration hazard

Aspiration hazard Based on available data the classification criteria are not met.

General information

The severity of the symptoms described will vary dependent on the concentration and the length of exposure.

Inhalation

Corrosive to the respiratory tract. Symptoms following overexposure may include the following: Severe irritation of nose and throat.

Ingestion

May cause chemical burns in mouth, oesophagus and stomach. Symptoms following overexposure may include the following: Severe stomach pain. Nausea, vomiting.

Skin contact

Causes severe burns. Symptoms following overexposure may include the following: Pain or irritation. Redness. Blistering may occur.

Eye contact

Causes serious eye damage. Symptoms following overexposure may include the following: Pain. Profuse watering of the eyes. Redness.

Route of exposure

Ingestion Inhalation Skin and/or eye contact

Target organs

No specific target organs known.

Perfluorohexanesulfonic acid

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

14.1. UN number

UN No. (ADR/RID) 1760

UN No. (IMDG) 1760

UN No. (ICAO) 1760

UN No. (ADN) 1760

14.2. UN proper shipping name

Proper shipping name (ADR/RID) CORROSIVE LIQUID, N.O.S.

Proper shipping name (IMDG) CORROSIVE LIQUID, N.O.S.

Proper shipping name (ICAO) CORROSIVE LIQUID, N.O.S.

Proper shipping name (ADN) CORROSIVE LIQUID, N.O.S.

14.3. Transport hazard class(es)

ADR/RID class 8

ADR/RID classification code C9

Perfluorohexanesulfonic acid

ADR/RID label	8
IMDG class	8
ICAO class/division	8
ADN class	8

Transport labels



14.4. Packing group

ADR/RID packing group	III
IMDG packing group	III
ADN packing group	III
ICAO packing group	III

14.5. Environmental hazards

Environmentally hazardous substance/marine pollutant

No.

14.6. Special precautions for user

EmS	F-A, S-B
ADR transport category	3
Emergency Action Code	2X
Hazard Identification Number (ADR/RID)	80
Tunnel restriction code	(E)

14.7. Transport in bulk according to Annex II of MARPOL 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.

Inventories

Perfluorohexanesulfonic acid

US - TSCA

Present.

SECTION 16: Other information

Abbreviations and acronyms used in the safety data sheet	<p>ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road.</p> <p>ADN: European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways.</p> <p>RID: European Agreement concerning the International Carriage of Dangerous Goods by Rail.</p> <p>IATA: International Air Transport Association.</p> <p>ICAO: Technical Instructions for the Safe Transport of Dangerous Goods by Air.</p> <p>IMDG: International Maritime Dangerous Goods.</p> <p>CAS: Chemical Abstracts Service.</p> <p>ATE: Acute Toxicity Estimate.</p> <p>LC₅₀: Lethal Concentration to 50 % of a test population.</p> <p>LD₅₀: Lethal Dose to 50% of a test population (Median Lethal Dose).</p> <p>EC₅₀: 50% of maximal Effective Concentration.</p> <p>PBT: Persistent, Bioaccumulative and Toxic substance.</p> <p>vPvB: Very Persistent and Very Bioaccumulative.</p>
Training advice	Only trained personnel should use this material.
Revision date	10/10/2018
Revision	1
SDS number	144929
Hazard statements in full	<p>H302 Harmful if swallowed.</p> <p>H312 Harmful in contact with skin.</p> <p>H314 Causes severe skin burns and eye damage.</p> <p>H318 Causes serious eye damage.</p> <p>H332 Harmful if inhaled.</p>

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.

SAFETY DATA SHEET

Version 6.1
Revision Date 03/12/2019
Print Date 07/18/2019

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Perfluorohexanoic acid
Product Number : 43809
Brand : Sigma-Aldrich
CAS-No. : 307-24-4

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 Street
ST. LOUIS MO 63103
UNITED STATES
Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)
H314 : Causes severe skin burns and eye damage.

Precautionary statement(s)
P260 : Do not breathe dust or mist.
P264 : Wash skin thoroughly after handling.
P280 : Wear protective gloves/ protective clothing/ eye protection/ face protection.

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 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
P363	Wash contaminated clothing before reuse.
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 ₆ HF ₁₁ O ₂
Molecular weight	:	314.06 g/mol
CAS-No.	:	307-24-4
EC-No.	:	206-196-6

Component	Classification	Concentration
Undecafluorohexanoic acid		
	Skin Corr. 1B; Eye Dam. 1; H314, H318	<= 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

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Hydrogen fluoride

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

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

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Recommended storage temperature 2 - 8 °C

Store under argon.

Storage class (TRGS 510): 8B: Non-combustible, corrosive hazardous materials

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

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

Hazardous components without workplace control parameters

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting | No data available |

	point/freezing point	
f)	Initial boiling point and boiling range	No data available
g)	Flash point	()No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	1.757 g/cm ³
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition 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

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

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen fluoride

Other decomposition products - No data available

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

SECTION 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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

UN number: 3265 Class: 8

Packing group: II

Proper shipping name: Corrosive liquid, acidic, organic, n.o.s. (Undecafluorohexanoic acid)

Reportable Quantity (RQ):

Poison Inhalation Hazard: No

IMDG

UN number: 3265 Class: 8

Packing group: II

EMS-No: F-A, S-B

Proper shipping name: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.

(Undecafluorohexanoic acid)

IATA

UN number: 3265 Class: 8

Packing group: II

Proper shipping name: Corrosive liquid, acidic, organic, n.o.s. (Undecafluorohexanoic acid)

SECTION 15: Regulatory information

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Undecafluorohexanoic acid

CAS-No.
307-24-4

Revision Date

Undecafluorohexanoic acid

CAS-No.
307-24-4

Revision Date

New Jersey Right To Know Components

Undecafluorohexanoic acid

CAS-No.
307-24-4

Revision Date

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

SECTION 16: Other information

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.1

Revision Date: 03/12/2019

Print Date: 07/18/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Perfluorononanoic acid

Product Number : 394459

Brand : Aldrich

CAS-No. : 375-95-1

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 sheetCompany : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

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

Warning

Hazard statement(s)

H315

Causes skin irritation.

H319

Causes serious eye irritation.

H335

May cause respiratory irritation.

Precautionary statement(s)

P261

Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.

P264

Wash skin thoroughly after handling.

P271

Use only outdoors or in a well-ventilated area.

P280

Wear protective gloves/ eye protection/ face protection.

P302 + P352

IF ON SKIN: Wash with plenty of soap and water.

P304 + P340

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

P305 + P351 + P338

IF IN EYES: Rinse cautiously with water for several minutes. Remove

P312 contact lenses, if present and easy to do. Continue rinsing.
 P321 Call a POISON CENTER/doctor if you feel unwell.
 P332 + P313 Specific treatment (see supplemental first aid instructions on this label).
 P337 + P313 If skin irritation occurs: Get medical advice/ attention.
 P362 If eye irritation persists: Get medical advice/ attention.
 P403 + P233 Take off contaminated clothing and wash before reuse.
 P405 Store in a well-ventilated place. Keep container tightly closed.
 P501 Store locked up.
 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : Heptadecafluorononanoic acid
 Perfluorononanoic acid

Formula : C₉HF₁₇O₂
 Molecular weight : 464.08 g/mol
 CAS-No. : 375-95-1
 EC-No. : 206-801-3

Hazardous components

Component	Classification	Concentration
Perfluorononan-1-oic acid	Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; H315, H319, H335	-

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

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

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: crystalline
Colour: beige |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 59 - 62 °C (138 - 144 °F) - lit. |
| f) Initial boiling point and boiling range | 218 °C (424 °F) at 987 hPa (740 mmHg) |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | No data available |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition 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

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

Bases, Oxidizing agents, Reducing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen fluoride

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

No data available

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 151.29 mg/l - 48 h

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

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

15. REGULATORY INFORMATION**SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

Acute Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Perfluorononan-1-oic acid	375-95-1	

New Jersey Right To Know Components

	CAS-No.	Revision Date
Perfluorononan-1-oic acid	375-95-1	

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Eye Irrit.	Eye irritation
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
Skin Irrit.	Skin irritation
STOT SE	Specific target organ toxicity - single exposure

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.6

Revision Date: 03/06/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Creation Date 02-Jul-2015

Revision Date 23-Jan-2018

Revision Number 3

1. Identification

Product Name Perfluorooctanesulfonamide
Cat No. : AC459640000; AC459640010; AC459640050
CAS-No 754-91-6
Synonyms No information available
Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number

For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US**:001-201-796-7100 / **Europe**: +32 14 57 52 99
CHEMTREC Tel. No.**US**:001-800-424-9300 / **Europe**:001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity

Category 3

Label Elements

Signal Word

Danger

Hazard Statements

Toxic if swallowed



Precautionary Statements

Prevention

Wash face, hands and any exposed skin thoroughly after handling

Do not eat, drink or smoke when using this product

Ingestion

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician

Rinse mouth

Storage

Store locked up

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Very toxic to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Heptadecafluorooctanesulphonamide	754-91-6	>95

4. First-aid measures

General Advice	Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.
Eye Contact	In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.
Ingestion	Do not induce vomiting. Call a physician or Poison Control Center immediately.
Most important symptoms and effects	No information available.
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	
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

Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous Combustion Products

None known

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health
2

Flammability
1

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions

Ensure adequate ventilation. Use personal protective equipment. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas. Avoid dust formation.

Environmental Precautions

Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up

Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dust formation.

7. Handling and storage

Handling

Use only under a chemical fume hood. Wear personal protective equipment. Do not breathe vapors/dust. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Do not ingest.

Storage

Keep containers tightly closed in a dry, cool and well-ventilated place.

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.

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

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State

Solid

Appearance

No information available

Odor

No information available

Odor Threshold

No information available

pH

No information available

Melting Point/Range

154 - 155 °C / 309.2 - 311 °F

Boiling Point/Range

No information available

Flash Point

No information available

Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	No information available
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	C8 H2 F17 N O2 S
Molecular Weight	499.15

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products. Excess heat.
Incompatible Materials	Strong oxidizing agents
Hazardous Decomposition Products	None under normal use conditions
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Heptadecafluorooctanesulphonamide	LD50 > 172 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
Heptadecafluorooctanesulphonamide	754-91-6	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	None known
STOT - repeated exposure	None known
Aspiration hazard	No information available
Symptoms / effects, both acute and delayed	No information available
Endocrine Disruptor Information	No information available
Other Adverse Effects	The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Persistence and Degradability	No information available
Bioaccumulation/ Accumulation	No information available.
Mobility	No information available.

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	UN2811
Proper Shipping Name	Toxic solid, organic, n.o.s
Proper technical name	Heptadecafluorooctanesulphonamide
Hazard Class	6.1
Packing Group	III

TDG

UN-No	UN2811
Proper Shipping Name	TOXIC SOLID, ORGANIC, N.O.S.
Hazard Class	6.1
Packing Group	III

IATA

UN-No	UN2811
Proper Shipping Name	TOXIC SOLID, ORGANIC, N.O.S.
Hazard Class	6.1
Packing Group	III

IMDG/IMO

UN-No	UN2811
Proper Shipping Name	TOXIC SOLID, ORGANIC, N.O.S.
Hazard Class	6.1
Packing Group	III

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
-----------	------	-----	------	--------	--------	-----	-------	------	------	-------	------

Heptadecafluorooctanesulphonamide	-	-	-	212-046-0	-		X	-	-	X	-
-----------------------------------	---	---	---	-----------	---	--	---	---	---	---	---

Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

Component	TSCA 12(b)
Heptadecafluorooctanesulphonamide	Section 5

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 Not applicable

California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations Not applicable

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 informationPrepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 02-Jul-2015

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

SAFETY DATA SHEET

Version 3.4
Revision Date 06/27/2014
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Heptadecafluorooctanesulfonic acid solution

Product Number : 77283

Brand : Aldrich

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H331
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 1B), H360
Effects on or via lactation, H362
Specific target organ toxicity - repeated exposure (Category 1), H372
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H302 Harmful if swallowed.
H314 Causes severe skin burns and eye damage.
H331 Toxic 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 through prolonged or repeated exposure.

H411	Toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ 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.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331	IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position 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).
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Formula : $C_8HF_{17}O_3S$

Molecular Weight : 500.13 g/mol

Hazardous components

Component	Classification	Concentration
Heptadecafluorooctane-1-sulphonic acid		
CAS-No.	1763-23-1	30 - 60 %
EC-No.	217-179-8	
Index-No.	607-624-00-8	
		Acute Tox. 4; Skin Corr. 1B; Eye Dam. 1; Carc. 2; Repr. 1B; Lact. ; STOT RE 1; Aquatic Acute 2; Aquatic Chronic 2; H302 + H332, H314, H351, H360, H362, H372, H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

no data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Sulphur 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**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**8.1 Control parameters****Components with workplace control parameters**

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: clear, liquid
Colour: light red |
| b) Odour | no data available |
| c) Odour Threshold | no data available |
| d) pH | no data available |
| e) Melting point/freezing point | no data available |
| f) Initial boiling point and boiling range | no data available |
| g) Flash point | no data available |
| h) Evaporation rate | no data available |
| i) Flammability (solid, gas) | no data available |
| j) Upper/lower flammability or explosive limits | no data available |
| k) Vapour pressure | no data available |
| l) Vapour density | no data available |
| m) Relative density | 1.250 g/cm ³ |
| n) Water solubility | no data available |
| o) Partition coefficient: n-octanol/water | no data available |
| p) Auto-ignition 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

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

Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

no data available

Inhalation: no data available

Dermal: no data available

no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitisation

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a

carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available
no data available

Specific target organ toxicity - single exposure

no data available

Specific target organ toxicity - repeated exposure

no data available

Aspiration hazard

no data available

Additional Information

RTECS: Not available

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin.

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3265 Class: 8 Packing group: II
Proper shipping name: Corrosive liquid, acidic, organic, n.o.s. (Heptadecafluorooctane-1-sulphonic acid)
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG

UN number: 3265 Class: 8 Packing group: II EMS-No: F-A, S-B
Proper shipping name: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (Heptadecafluorooctane-1-sulphonic acid)
Marine pollutant: No

IATA

UN number: 3265

Class: 8

Packing group: II

Proper shipping name: Corrosive liquid, acidic, organic, n.o.s. (Heptadecafluorooctane-1-sulphonic acid)

15. REGULATORY INFORMATION**SARA 302 Components**

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

Acute Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Water	7732-18-5	
Heptadecafluorooctane-1-sulphonic acid	1763-23-1	2009-07-17

New Jersey Right To Know Components

	CAS-No.	Revision Date
Water	7732-18-5	
Heptadecafluorooctane-1-sulphonic acid	1763-23-1	2009-07-17

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
Eye Dam.	Serious eye damage
H302	Harmful if swallowed.
H302 + H332	Harmful if swallowed or if inhaled
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H331	Toxic 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 through prolonged or repeated exposure.
H401	Toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.
Lact.	Effects on or via lactation

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	3
Fire Hazard:	0

Reactivity Hazard: 0

Further information

Copyright 2014 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.4

Revision Date: 06/27/2014

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 03/12/2019
Print Date 06/28/2019**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Perfluorooctanoic acid

Product Number : 171468

Brand : Aldrich

CAS-No. : 335-67-1

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

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

Serious eye damage (Category 1), H318

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

Hazard statement(s)	
H302 + H332	Harmful if swallowed or if inhaled.
H318	Causes serious eye damage.
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/ vapours/ 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.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
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

Synonyms : Pentadecafluorooctanoic acid
Perfluorocaprylic acid
Perfluorooctanoic acid

Formula : C₈HF₁₅O₂
Molecular weight : 414.07 g/mol
CAS-No. : 335-67-1
EC-No. : 206-397-9

Component	Classification	Concentration
Pentadecafluorooctanoic acid		
	Acute Tox. 4; Eye Dam. 1; Carc. 2; Repr. 1B; Lact. ; STOT RE 1; H302, H332, H318, 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

Move out of dangerous area. Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Continue rinsing eyes during transport to hospital. Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Hydrogen fluoride

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods 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.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials 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

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

Hazardous components without workplace control parameters

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: > 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: > 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|--|---|
| a) Appearance | Form: flakes
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | 2.6 at 1 g/l |
| e) Melting point/freezing point | Melting point/range: 55 - 56 °C (131 - 133 °F) - lit. |
| f) Initial boiling point and boiling range | 189 °C 372 °F at 981 hPa - lit. |

g) Flash point	()No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	0.69 hPa at 25 °C (77 °F)
l) Vapour density	No data available
m) Relative density	0.900 g/cm ³
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

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

Bases, Oxidizing agents, Reducing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen fluoride

Other decomposition products - No data available

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Rat - 189 mg/kg

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Rat

DNA damage

Rat

DNA damage

Carcinogenicity

Suspected human carcinogens

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Pentadecafluorooctanoic acid)

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

Effects on or via lactation

Presumed human reproductive toxicant

No data available

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

Additional Information

RTECS: RH0781000

Cough, Shortness of breath, Headache, Nausea, Vomiting

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

UN number: 3261 Class: 8

Packing group: III

Proper shipping name: Corrosive solid, acidic, organic, n.o.s. (Pentadecafluorooctanoic acid)

Reportable Quantity (RQ):

Poison Inhalation Hazard: No

IMDG

UN number: 3261 Class: 8

Packing group: III

EMS-No: F-A, S-B

Proper shipping name: CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S. (Pentadecafluorooctanoic acid)

IATA

UN number: 3261 Class: 8

Packing group: III

Proper shipping name: Corrosive solid, acidic, organic, n.o.s. (Pentadecafluorooctanoic acid)

SECTION 15: Regulatory information**SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

Acute Health Hazard, Chronic Health Hazard

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

Pentadecafluorooctanoic acid	CAS-No. 335-67-1	Revision Date
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Pentadecafluorooctanoic acid	CAS-No. 335-67-1	Revision Date
------------------------------	---------------------	---------------

New Jersey Right To Know Components

Pentadecafluorooctanoic acid	CAS-No. 335-67-1	Revision Date
------------------------------	---------------------	---------------

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

SECTION 16: Other information**Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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SAFETY DATA SHEET

Version 6.0
Revision Date 06/10/2019
Print Date 06/28/2019**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Perfluoropentanoic acid

Product Number : 396575
Brand : Aldrich
CAS-No. : 2706-90-3**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 sheetCompany : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATESTelephone : +1 314 771-5765
Fax : +1 800 325-5052**1.4 Emergency telephone number**

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**Serious eye damage (Category 1), H318
Reproductive toxicity (Category 2), H361

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H318

Causes serious eye damage.

H361

Suspected of damaging fertility or the unborn child.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202	Do not handle until all safety precautions have been read and understood.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
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

Synonyms	:	Nonafluorovaleric acid Perfluoropentanoic acid Nonafluoropentanoic acid
Formula	:	C ₅ HF ₉ O ₂
Molecular weight	:	264.05 g/mol
CAS-No.	:	2706-90-3
EC-No.	:	220-300-7

Component	Classification	Concentration
Perfluorovaleric acid		
	Eye Dam. 1; Repr. 2; H318, H361	<= 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

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Nature of decomposition products not known.

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Storage class (TRGS 510): 8A: Combustible, corrosive hazardous materials

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

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|--|--|
| a) Appearance | Form: clear, liquid
Colour: light brown |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | No data available |
| f) Initial boiling point and boiling range | 140 °C 284 °F - lit. |
| g) Flash point | No data available |

h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	1.713 g/cm ³ at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition 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

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

Other decomposition products - No data available

Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation: No data available
Dermal: No data available
No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

Suspected of damaging the unborn child.
No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Cough, Shortness of breath, Headache, Nausea

SECTION 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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPO.

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.

Pennsylvania Right To Know Components

Perfluorovaleric acid

CAS-No.
2706-90-3

Revision Date

SECTION 16: Other information

Further information

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Version: 6.0

Revision Date: 06/10/2019

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 5.3
Revision Date 06/30/2014
Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Perfluoroundecanoic acid

Product Number : 446777
Brand : Aldrich

CAS-No. : 2058-94-8

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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
Acute toxicity, Dermal (Category 4), H312
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319

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

Warning

Hazard statement(s)
H302 + H312 + H332
H315
H319

Harmful if swallowed, in contact with skin or if inhaled
Causes skin irritation.
Causes serious eye irritation.

Precautionary statement(s)

P261
P264
P270
P271
P280
P301 + P312

Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
Wash skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Wear protective gloves/ eye protection/ face protection.
IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you

P302 + P352 P304 + P340	feel unwell. IF ON SKIN: Wash with plenty of soap and water. IF INHALED: Remove victim to fresh air and keep at rest in a position 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.
P322	Specific measures (see supplemental first aid instructions on this label).
P330	Rinse mouth.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₁₁ HF ₂₁ O ₂
Molecular Weight	: 564.09 g/mol
CAS-No.	: 2058-94-8
EC-No.	: 218-165-4

Hazardous components

Component	Classification	Concentration
Henicosaflluoroundecanoic acid Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)		
	Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; H302 + H312 + H332, H315, H319	-

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

no data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

- 5.2 Special hazards arising from the substance or mixture**
Carbon oxides, 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

- 6.1 Personal precautions, protective equipment and emergency procedures**
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Avoid breathing dust.
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**
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.
- 6.4 Reference to other sections**
For disposal see section 13.

7. HANDLING AND STORAGE

- 7.1 Precautions for safe handling**
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.
For precautions see section 2.2.
- 7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place.
- 7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

- 8.1 Control parameters**
- Components with workplace control parameters**
Contains no substances with occupational exposure limit values.
- 8.2 Exposure controls**
- Appropriate engineering controls**
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.
- Personal protective equipment**
- Eye/face protection**
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).
- Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.
- Body Protection**
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: solid |
| b) Odour | no data available |
| c) Odour Threshold | no data available |
| d) pH | no data available |
| e) Melting point/freezing point | Melting point/range: 96 - 101 °C (205 - 214 °F) - lit. |
| f) Initial boiling point and boiling range | 160 °C (320 °F) at 80 hPa (60 mmHg) - lit. |
| g) Flash point | 113 °C (235 °F) - closed cup |
| h) Evaporation rate | no data available |
| i) Flammability (solid, gas) | no data available |
| j) Upper/lower flammability or explosive limits | no data available |
| k) Vapour pressure | no data available |
| l) Vapour density | no data available |
| m) Relative density | no data available |
| n) Water solubility | no data available |
| o) Partition coefficient: n-octanol/water | no data available |
| p) Auto-ignition 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

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

Oxidizing agents

10.6 Hazardous decomposition products

Other decomposition products - no data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

no data available

no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitisation

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

no data available

Specific target organ toxicity - single exposure

no data available

Specific target organ toxicity - repeated exposure

no data available

Aspiration hazard

no data available

Additional Information

RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

Acute Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Henicosaf fluoroundecanoic acid

CAS-No.
2058-94-8

Revision Date

New Jersey Right To Know Components

Henicosaf fluoroundecanoic acid

CAS-No.
2058-94-8

Revision Date

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Eye Irrit.	Eye irritation
H302	Harmful if swallowed.
H302 + H312 + H332	Harmful if swallowed, in contact with skin or if inhaled
H312	Harmful in contact with skin.
H315	Causes skin irritation.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	
Flammability:	1
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	1
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.3

Revision Date: 06/30/2014

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 6.2
Revision Date 05/25/2018
Print Date 06/29/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Phenanthrene

Product Number : P11409

Brand : Aldrich

CAS-No. : 85-01-8

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

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 aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Warning

Hazard statement(s)

H302

Harmful if swallowed.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P264

Wash skin thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.
 P273 Avoid release to the environment.
 P301 + P312 + P330 IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.
 Rinse mouth.
 P391 Collect spillage.
 P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS
 Photosensitizer.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Molecular weight : 178.23 g/mol
 CAS-No. : 85-01-8
 EC-No. : 201-581-5

Hazardous components

Component	Classification	Concentration
Phenanthrene	Acute Tox. 4; Aquatic Acute 1; Aquatic Chronic 1; H302, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Handle and store under inert gas.

Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Phenanthrene	85-01-8	TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	1910.1002 As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard OSHA specifically regulated carcinogen		
		TWA	0.100000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products. cyclohexane-extractable fraction See Appendix C		

		See Appendix A		
		PEL	0.2 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Coal tar pitch volatiles (benzene or cyclohexane-soluble fraction) include fused polycyclic hydrocarbons (some of which are known carcinogens) which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard.		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Phenanthrene	85-01-8	1-Hydroxypyrene		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance	Form: solid
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 98 - 100 °C (208 - 212 °F)
f) Initial boiling point and boiling range	340 °C (644 °F)
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	1.063 g/mL at 25 °C (77 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 4.46
p) Auto-ignition 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

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

Oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Mouse - 700.0 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

Causes photosensitivity. Exposure to light can result in allergic reactions resulting in dermatologic lesions, which can vary from sunburnlike responses to edematous, vesiculated lesions, or bullae

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - *Oncorhynchus mykiss* (rainbow trout) - 3.2 mg/l - 96.0 h(Phenanthrene)

Toxicity to daphnia and other aquatic invertebrates EC50 - *Daphnia pulex* (Water flea) - 0.35 mg/l - 48 h(Phenanthrene)

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation Pimephales promelas (fathead minnow) - 28 d
- 0.00255 mg/l(Phenanthrene)

Bioconcentration factor (BCF): 5,100

12.4 Mobility in soil

No data available(Phenanthrene)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Phenanthrene)
Reportable Quantity (RQ) : 5000 lbs

no

Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Phenanthrene)
Marine pollutant : yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Phenanthrene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Phenanthrene	85-01-8	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard

Massachusetts Right To Know Components

CAS-No.	Revision Date
---------	---------------

Phenanthrene	85-01-8	2007-07-01
Pennsylvania Right To Know Components		
Phenanthrene	CAS-No. 85-01-8	Revision Date 2007-07-01
New Jersey Right To Know Components		
Phenanthrene	CAS-No. 85-01-8	Revision Date 2007-07-01
California Prop. 65 Components		
WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No. 85-01-8	Revision Date 2007-09-28
Phenanthrene		

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H302	Harmful if swallowed.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	1
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
 Product Safety – Americas Region
 1-800-521-8956
 Version: 6.2

Revision Date: 05/25/2018

Print Date: 06/29/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Phenol

Product Number : P1037

Brand : Sigma-Aldrich

Index-No. : 604-001-00-2

CAS-No. : 108-95-2

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301

Acute toxicity, Inhalation (Category 3), H331

Acute toxicity, Dermal (Category 3), H311

Skin corrosion (Category 1B), H314

Serious eye damage (Category 1), H318

Germ cell mutagenicity (Category 2), H341

Specific target organ toxicity - repeated exposure (Category 2), H373

Acute aquatic toxicity (Category 3), H402

Chronic aquatic toxicity (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled.
H314	Causes severe skin burns and eye damage.
H341	Suspected of causing genetic defects.
H373	May cause damage to organs through prolonged or repeated exposure.
H402	Harmful to aquatic life.
H411	Toxic to aquatic life with long lasting effects.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
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 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
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 Hazards not otherwise classified (HNOC) or not covered by GHS

Vesicant., Rapidly absorbed through skin.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Hydroxybenzene
Formula	:	C ₆ H ₆ O
Molecular weight	:	94.11 g/mol
CAS-No.	:	108-95-2
EC-No.	:	203-632-7
Index-No.	:	604-001-00-2
Registration number	:	01-2119471329-32-XXXX

Hazardous components

Component	Classification	Concentration
Phenol	Acute Tox. 3; Skin Corr. 1B; Eye Dam. 1; Muta. 2; STOT RE 2; Aquatic Acute 3; Aquatic Chronic 2; H301 + H311 + H331, H314, H341, H373, H402, H411	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Recommended storage temperature 2 - 8 °C

Light sensitive. Handle and store under inert gas.

Storage class (TRGS 510): 6.1B: Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Phenol	108-95-2	TWA	5 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Upper Respiratory Tract irritation Lung damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	5 ppm 19 mg/m ³	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		C	15.6 ppm 60 mg/m ³	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption 15 minute ceiling value		
		TWA	5 ppm 19 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation The value in mg/m ³ is approximate.		
		PEL	5 ppm 19 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Aromatic compound	-	Phenol	250mg/g Creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 480 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.2 mm

Break through time: 30 min

Material tested: Dermatril® P (KCL 743 / Aldrich Z677388, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: solid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | 6.0 |
| e) Melting point/freezing point | Melting point/range: 38 - 43 °C (100 - 109 °F) |
| f) Initial boiling point and boiling range | 182.0 °C (359.6 °F) |
| g) Flash point | 79.0 °C (174.2 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 8.6 %(V)
Lower explosion limit: 1.7 %(V) |
| k) Vapour pressure | 6.3 hPa (4.7 mmHg) at 55.0 °C (131.0 °F)
0.5 hPa (0.4 mmHg) at 20.0 °C (68.0 °F) |
| l) Vapour density | No data available |
| m) Relative density | 1.07 g/cm ³ |

- | | |
|---|-------------------------|
| n) Water solubility | 84 g/l at 20 °C (68 °F) |
| o) Partition coefficient: n-octanol/water | log Pow: 1.46 |
| p) Auto-ignition temperature | 715.0 °C (1,319.0 °F) |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety information

Surface tension 38.2 mN/m at 50.0 °C (122.0 °F)

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

Strong oxidizing agents, Strong bases, Strong acids

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 410.0 - 650.0 mg/kg

LD50 Oral - Rat - 317.0 mg/kg

Remarks: Behavioral:Convulsions or effect on seizure threshold.

LC50 Inhalation - Rat - 8 h - 900 mg/m³

LD50 Dermal - Rabbit - 630.0 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Severe skin irritation - 24 h

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Corrosive

(OECD Test Guideline 405)

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

In vitro tests showed mutagenic effects

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

May cause damage to organs through prolonged or repeated exposure.

Aspiration hazard

No data available

Additional Information

RTECS: SJ3325000

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Circulatory collapse, tachypnea, paralysis, Convulsions, Coma., necrosis of mouth and G.I. Tract, Jaundice, respiratory failure, cardiac arrest To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - Leuciscus idus (Golden orfe) - 14.00 - 25.00 mg/l - 48 h

LC50 - Carassius auratus (goldfish) - 36.10 - 68.80 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 56 mg/l - 48 h

Toxicity to algae EC50 - Chlorella vulgaris (Fresh water algae) - 370.00 mg/l - 96 h

12.2 Persistence and degradability

Biodegradability Result: - Readily biodegradable.

12.3 Bioaccumulative potential

Bioaccumulation Danio rerio (zebra fish) - 5 h
- 2 mg/l

Bioconcentration factor (BCF): 17.5

Remarks: Does not bioaccumulate.

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1671 Class: 6.1 Packing group: II
Proper shipping name: Phenol, solid
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1671 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: PHENOL, SOLID
Marine pollutant:yes

IATA

UN number: 1671 Class: 6.1 Packing group: II
Proper shipping name: Phenol, solid

15. REGULATORY INFORMATION

SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Phenol	108-95-2	2007-07-01

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Phenol	108-95-2	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Phenol	108-95-2	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Phenol	108-95-2	2007-07-01

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Eye Dam.	Serious eye damage
H301	Toxic if swallowed.
H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled.
H311	Toxic in contact with skin.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H331	Toxic if inhaled.
H341	Suspected of causing genetic defects.
H373	May cause damage to organs through prolonged or repeated exposure.

Further information

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Preparation Information

Sigma-Aldrich Corporation
 Product Safety – Americas Region
 1-800-521-8956

Version: 5.8

Revision Date: 07/28/2018

Print Date: 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Potassium

Product Number : 244856

Brand : Aldrich

Index-No. : 019-001-00-2

CAS-No. : 7440-09-7

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 sheetCompany : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Substances and mixtures, which in contact with water, emit flammable gases (Category 1), H260

Skin corrosion (Category 1A), H314

Serious eye damage (Category 1), H318

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H260

In contact with water releases flammable gases which may ignite spontaneously.

H314

Causes severe skin burns and eye damage.

H318

Causes serious eye damage.

Precautionary statement(s)

P223

Keep away from any possible contact with water, because of violent reaction and possible flash fire.

P231 + P232

Handle under inert gas. Protect from moisture.

P260

Do not breathe dust or mist.

P264

Wash skin thoroughly after handling.

P280

Wear protective gloves/ protective clothing/ eye protection/ face

P301 + P330 + P331 P303 + P361 + P353	protection. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P363	Wash contaminated clothing before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P402 + P404	Store in a dry place. Store in a closed container.
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

Reacts violently with water.
May form explosive peroxides.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	K
Molecular weight	:	39.10 g/mol
CAS-No.	:	7440-09-7
EC-No.	:	231-119-8
Index-No.	:	019-001-00-2

Hazardous components

Component	Classification	Concentration
Potassium	Water-react. 1; Skin Corr. 1A; Eye Dam. 1; H260, H314, H318	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Dry powder

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water.

Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Never allow product to get in contact with water during storage.

Handle and store under inert gas.

Storage class (TRGS 510): 4.3: Hazardous materials, which set free flammable gases upon contact with water

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|--|--|
| a) Appearance | Form: Ingots
Colour: grey |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 64 °C (147 °F) - lit. |
| f) Initial boiling point and boiling range | 760 °C (1,400 °F) - lit. |
| g) Flash point | Not applicable |

h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	0.12 hPa (0.09 mmHg) at 260 °C (500 °F)
l) Vapour density	No data available
m) Relative density	0.86 g/cm ³ at 25 °C (77 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Test for peroxide formation before using or discard after 3 months.
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Reacts violently with water.

10.4 Conditions to avoid

Exposure to moisture

10.5 Incompatible materials

Oxidizing agents, Carbon oxides, Reacts violently with water., Reacts with water to generate Hydrogen gas.

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Potassium oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - 700 mg/kg

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: TS6460000

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin.

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2257 Class: 4.3 Packing group: I
Proper shipping name: Potassium
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG

UN number: 2257 Class: 4.3 Packing group: I EMS-No: F-G, S-N
Proper shipping name: POTASSIUM

IATA

UN number: 2257 Class: 4.3 Packing group: I
Proper shipping name: Potassium
IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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.

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Potassium	7440-09-7	1993-02-16

	CAS-No.	Revision Date
Potassium	7440-09-7	1993-02-16

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Potassium	7440-09-7	1993-02-16

	CAS-No.	Revision Date
Potassium	7440-09-7	1993-02-16

	CAS-No.	Revision Date
Potassium	7440-09-7	1993-02-16

New Jersey Right To Know Components

	CAS-No.	Revision Date
Potassium	7440-09-7	1993-02-16

	CAS-No.	Revision Date
Potassium	7440-09-7	1993-02-16

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Eye Dam.	Serious eye damage
H260	In contact with water releases flammable gases which may ignite spontaneously.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
Skin Corr.	Skin corrosion
Water-react.	Substances and mixtures, which in contact with water, emit flammable gases

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	
Flammability:	4
Physical Hazard	2

NFPA Rating

Health hazard:	3
Fire Hazard:	4
Reactivity Hazard:	2
Special hazard.I:	W

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.11

Revision Date: 04/13/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 05/28/2017
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Pyrene

Product Number : 185515

Brand : Aldrich

CAS-No. : 129-00-0

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Warning

Hazard statement(s)

H410 : Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P273 : Avoid release to the environment.

P391 : Collect spillage.

P501 : Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Rapidly absorbed through skin.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : Benzo[*a*]phenanthrene

Formula : C₁₆H₁₀

Molecular weight : 202.25 g/mol

CAS-No. : 129-00-0

EC-No. : 204-927-3

Hazardous components

Component	Classification	Concentration
Pyrene		
	Aquatic Acute 1; Aquatic Chronic 1; H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Further processing of solid materials may result in the formation of combu formation should be taken into consideration before additional processing

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**8.1 Control parameters****Components with workplace control parameters**

Component	CAS-No.	Value	Control parameters	Basis
Pyrene	129-00-0	TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	1910.1002 As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard OSHA specifically regulated carcinogen		
		TWA	0.100000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products. cyclohexane-extractable fraction See Appendix C See Appendix A		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Pyrene	129-00-0	1-Hydroxypyrene (1-HP)		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 480 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 30 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Respiratory protection is not required. Where protection from nuisance le (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|--|---|
| a) Appearance | Form: crystalline
Colour: yellow |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 145 - 148 °C (293 - 298 °F) - lit. |
| f) Initial boiling point and boiling range | 390.0 - 395.0 °C (734.0 - 743.0 °F) |
| g) Flash point | > 200.0 °C (> 392.0 °F) |
| h) Evaporation rate | No data available |

- | | |
|---|------------------------|
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | 1.21 g/cm ³ |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | log Pow: 4.88 |
| p) Auto-ignition 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

Bulk density	650 kg/m ³
--------------	-----------------------

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

Risk of dust explosion.

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

Dermal: No data available(Pyrene)

No data available(Pyrene)

Skin corrosion/irritation

Serious eye damage/eye irritation

Respiratory or skin sensitisation

No data available(Pyrene)

Germ cell mutagenicity

No data available(Pyrene)

Carcinogenicity

No data available(Pyrene)
(Pyrene)

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: OSHA specifically regulated carcinogen (Pyrene)

Reproductive toxicity

No data available(Pyrene)

No data available(Pyrene)

Specific target organ toxicity - single exposure

No data available(Pyrene)

Specific target organ toxicity - repeated exposure

Aspiration hazard

No data available(Pyrene)

Additional Information

RTECS: UR2450000

Inhalation studies in animals have caused:, Liver toxicity, pulmonary pathologies, intragastric pathologies, neutropenia, leukopenia, anemia, Contact with skin can cause:, hyperemia, weight loss, hematopoietic changes, Dermatitis, Chronic effects, leukocytosis(Pyrene)

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - Oncorhynchus mykiss (rainbow trout) - > 2 mg/l - 96.0 h(Pyrene)

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 0.002 - 0.003 mg/l - 48 h(Pyrene)

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation other fish - 48 h
- 0.056 mg/l(Pyrene)

Bioconcentration factor (BCF): 4,810

12.4 Mobility in soil

No data available(Pyrene)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life with long lasting effects.

Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Pyrene)
Reportable Quantity (RQ) : 5000 lbs

no

Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Pyrene)
Marine pollutant : yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Pyrene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Pyrene	129-00-0	2008-11-03

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

	CAS-No.	Revision Date
Pyrene	129-00-0	2008-11-03

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Pyrene	129-00-0	2008-11-03

New Jersey Right To Know Components

	CAS-No.	Revision Date
Pyrene	129-00-0	2008-11-03

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer.	129-00-0	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H400 Very toxic to aquatic life.
H410 Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard: 0
Chronic Health Hazard:
Flammability: 0
Physical Hazard 0

NFPA Rating

Health hazard: 0
Fire Hazard: 0
Reactivity Hazard: 0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1

Revision Date: 05/28/2017

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 3.12
Revision Date 05/04/2017
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Silver

Product Number : 85131
Brand : Aldrich

CAS-No. : 7440-22-4

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Warning

Hazard statement(s)

H410 : Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P273 : Avoid release to the environment.

P391 : Collect spillage.

P501 : Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS**3.1 Substances**

Formula : Ag
Molecular weight : 107.87 g/mol

CAS-No. : 7440-22-4
EC-No. : 231-131-3

Hazardous components

Component	Classification	Concentration
Silver		
	Aquatic Acute 1; Aquatic Chronic 1; H410	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Air sensitive. Store under inert gas.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Silver	7440-22-4	TWA	0.010000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.010000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.100000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Argyria		
		TWA	0.010000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.010000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.010000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.100000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Argyria		
		TWA	0.010000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Argyria		
		TWA	0.01 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	0.01 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: crystalline |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 960 °C (1,760 °F) - lit. |
| f) Initial boiling point and boiling range | 2,212 °C (4,014 °F) - lit. |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |

k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

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

Oxygen, Strong acids and strong bases

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Silver/silver oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

LD50 Oral - Rat - male - > 5,000 mg/kg

Inhalation: No data available

Inhalation: No data available

Dermal: No data available

Dermal: No data available

No data available

No data available

Skin corrosion/irritation

No data available

No data available

Serious eye damage/eye irritation

No data available

No data available

Respiratory or skin sensitisation

No data available

No data available

Germ cell mutagenicity

No data available

No data available

Carcinogenicity

Carcinogenicity - Rat - Unreported

Tumorigenic:Tumors at site or application.

Carcinogenicity classification not possible from current data.

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

No data available

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

May cause argyria (a slate-gray or bluish discoloration of the skin and deep tissues due to the deposit of insoluble albuminate of silver).

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

No data available

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Silver)
Reportable Quantity (RQ): 1 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Marine pollutant:yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s.

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Silver	7440-22-4	1993-04-24

SARA 311/312 Hazards

No SARA Hazards

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Silver	7440-22-4	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Silver	7440-22-4	1993-04-24

	CAS-No.	Revision Date
Silver	7440-22-4	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
--	---------	---------------

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.12

Revision Date: 05/04/2017

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.2
Revision Date 05/28/2017
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Sodium

Product Number : 483745

Brand : Aldrich

CAS-No. : 7440-23-5

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Substances and mixtures, which in contact with water, emit flammable gases (Category 1), H260

Skin corrosion (Category 1B), H314

Serious eye damage (Category 1), H318

Carcinogenicity (Category 1A), H350

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H260

In contact with water releases flammable gases which may ignite spontaneously.

H314

Causes severe skin burns and eye damage.

H318

Causes serious eye damage.

H350

May cause cancer.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P223	Keep away from any possible contact with water, because of violent reaction and possible flash fire.
P231 + P232	Handle under inert gas. Protect from moisture.
P260	Do not breathe dust or mist.
P264	Wash skin thoroughly after handling.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P281	Use personal protective equipment as required.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P363	Wash contaminated clothing before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P402 + P404	Store in a dry place. Store in a closed container.
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

Reacts violently with water.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Formula : Na
Molecular weight : 22.99 g/mol

Hazardous components

Component	Classification	Concentration
Sodium		
CAS-No. 7440-23-5 EC-No. 231-132-9 Index-No. 011-001-00-0	Water-react. 1; Skin Corr. 1B; Eye Dam. 1; H260, H314	>= 90 - <= 100 %
Paraffin oils		
CAS-No. 8012-95-1 EC-No. 232-384-2	Asp. Tox. 1; H304, H304	>= 90 - <= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Dry powder

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Sodium oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustion products. Formation should be taken into consideration before additional processing

Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Never allow product to get in contact with water during storage.

Handle and store under inert gas. Air sensitive.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Paraffin oils	8012-95-1	STEL	10.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation 2015 Adoption Not classifiable as a human carcinogen		
		Upper Respiratory Tract irritation 2015 Adoption Exposure by all routes should be carefully controlled to levels as low as possible. Suspected human carcinogen		
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Upper Respiratory Tract irritation Exposure by all routes should be carefully controlled to levels as low as possible. Suspected human carcinogen		
		TWA	5.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Not classifiable as a human carcinogen		
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Upper Respiratory Tract irritation Exposure by all routes should be carefully controlled to levels as low as possible. Suspected human carcinogen		

		TWA	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Not classifiable as a human carcinogen		
		TWA	5 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10 mg/m3	USA. NIOSH Recommended Exposure Limits

Hazardous components without workplace control parameters

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (EN 143) respirator cartridges as a backup to engineering controls. If th full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance

Form: Pieces

b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 97.8 °C (208.0 °F) - lit.
f) Initial boiling point and boiling range	883 °C (1621 °F) - lit.
g) Flash point	82 °C (180 °F)
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	0.97 g/cm ³
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

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

Reacts violently with water.

10.4 Conditions to avoid

Air Do not allow water to enter container.

Exposure to moisture

10.5 Incompatible materials

Oxidizing agents

10.6 Hazardous decomposition products

Other decomposition products - No data available

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Sodium oxides

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Aspiration may lead to:, lipid pneumonia, Effects due to ingestion may include:, laxative effect, Gastrointestinal disturbance, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

Burn in a chemical incinerator equipped with an afterburner and scrubber b highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chem scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 1428 Class: 4.3 Packing group: I

Proper shipping name: Sodium

Reportable Quantity (RQ) : 10 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1428 Class: 4.3 Packing group: I EMS-No: F-G, S-N

Proper shipping name: SODIUM

IATA

UN number: 1428 Class: 4.3 Packing group: I

Proper shipping name: Sodium

IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION**SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

Reactivity Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Sodium	7440-23-5	1993-04-24
Paraffin oils	8012-95-1	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Sodium	7440-23-5	1993-04-24
Paraffin oils	8012-95-1	2007-03-01

New Jersey Right To Know Components

Sodium
Paraffin oils

CAS-No.
7440-23-5
8012-95-1

Revision Date
1993-04-24
2007-03-01

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Asp. Tox.	Aspiration hazard
Eye Dam.	Serious eye damage
H260	In contact with water releases flammable gases which may ignite spontaneously.
H304	May be fatal if swallowed and enters airways.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H350	May cause cancer.
Skin Corr.	Skin corrosion
Water-react.	Substances and mixtures, which in contact with water, emit flammable gases

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	4
Physical Hazard	2

NFPA Rating

Health hazard:	3
Fire Hazard:	4
Reactivity Hazard:	2
Special hazard.I:	W

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.2

Revision Date: 05/28/2017

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 06/17/2019
Print Date 06/29/2019**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Styrene

Product Number : S4972

Brand : Sigma-Aldrich

Index-No. : 601-026-00-0

CAS-No. : 100-42-5

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 3), H226
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - repeated exposure (Category 1), hearing organs, H372
Short-term (acute) aquatic hazard (Category 2), H401

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word	Danger
Hazard statement(s)	
H226	Flammable liquid and vapour.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H351	Suspected of causing cancer.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs (hearing organs) through prolonged or repeated exposure.
H401	Toxic to aquatic life.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
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

Lachrymator.

SECTION 3: Composition/information on ingredients**3.1 Substances**

Formula : C₈H₈
Molecular weight : 104.15 g/mol
CAS-No. : 100-42-5
EC-No. : 202-851-5
Index-No. : 601-026-00-0

Component	Classification	Concentration
Styrene		
	Flam. Liq. 3; Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; Repr. 2; STOT RE 1; Aquatic Acute 2; H226, H332, H315, H319, H351, H361, H372, H401	<= 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**

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Dry powder Dry sand

Unsuitable extinguishing media

Do NOT use water jet.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

Container explosion may occur under fire conditions., Vapours may form explosive mixture with air.

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Recommended storage temperature 2 - 8 °C

Light sensitive.

Storage class (TRGS 510): 3: Flammable liquids

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

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Styrene	100-42-5	TWA	50 ppm 215 mg/m ³	USA. NIOSH Recommended Exposure Limits
		ST	100 ppm 425 mg/m ³	USA. NIOSH Recommended Exposure Limits
	Remarks	See Table Z-2		
		TWA	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.15-1969		
		CEIL	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.15-1969		
		Peak	600 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.15-1969		
		C	500 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		PEL	50 ppm 215 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		STEL	100 ppm 425 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		TWA	20 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Peripheral neuropathy Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		

		STEL	40 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Peripheral neuropathy Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Styrene	100-42-5	Mandelic acid plus phenylglyoxylic acid	400mg/g Creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			
		Styrene	40 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: > 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 32 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This

recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: liquid, clear Colour: colourless
b) Odour	sweet
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: -31 °C (-24 °F) - lit.
f) Initial boiling point and boiling range	145 - 146 °C 293 - 295 °F - lit.
g) Flash point	32.0 °C (89.6 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	Upper explosion limit: 8.9 %(V) Lower explosion limit: 1.1 %(V)
k) Vapour pressure	6 hPa at 20 °C (68 °F)
l) Vapour density	3.6
m) Relative density	0.906 g/cm ³ at 25 °C (77 °F)
n) Water solubility	0.05 g/l at 25 °C (77 °F) - slightly soluble
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition temperature	490.0 °C (914.0 °F) 480.0 °C (896.0 °F)

- q) Decomposition temperature No data available
- r) Viscosity No data available
- s) Explosive properties No data available
- t) Oxidizing properties No data available

9.2 Other safety information

Relative vapour density 3.6

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.
Contains the following stabiliser(s):
4-tert-Butylpyrocatechol (>=30 - <=50 ppm)

10.3 Possibility of hazardous reactions

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

May polymerize on exposure to light.
Heat, flames and sparks.

10.5 Incompatible materials

Oxidizing agents, Copper

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 2,650 mg/kg

Remarks: Behavioral: Somnolence (general depressed activity). Liver: Other changes.

LC50 Inhalation - Rat - 4 h - 12,000 mg/m³

LD50 Dermal - Rat - male and female - > 2,000 mg/kg
(OECD Test Guideline 402)

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Skin irritation

(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Eye irritation

Respiratory or skin sensitisation

Maximisation Test - Guinea pig

Does not cause skin sensitisation.

(OECD Test Guideline 406)

Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Styrene)

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

Suspected of damaging the unborn child. Suspected human reproductive toxicant

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Causes damage to organs through prolonged or repeated exposure. - hearing organs

Aspiration hazard

No data available

Additional Information

RTECS: WL3675000

Dermatitis, Central nervous system depression, Nausea, Dizziness, Headache, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Endocrine system. -

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 32 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 4.7 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	IC50 - Pseudokirchneriella subcapitata (green algae) - 1.4 mg/l - 72 h

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 d

Result: > 60 % - Readily biodegradable.

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

Toxic to aquatic life.

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

UN number: 2055 Class: 3 Packing group: III

Proper shipping name: Styrene monomer, stabilized

Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 2055 Class: 3 Packing group: III EMS-No: F-E, S-D

Proper shipping name: STYRENE MONOMER, STABILIZED

IATA

UN number: 2055 Class: 3 Packing group: III

Proper shipping name: Styrene monomer, stabilized

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

Styrene

CAS-No.
100-42-5

Revision Date
2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Styrene

CAS-No.
100-42-5

Revision Date
2007-07-01

SECTION 16: Other information

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.1

Revision Date: 06/17/2019

Print Date: 06/29/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Tetrachloroethylene

Product Number : 371696
Brand : Sigma-Aldrich
Index-No. : 602-028-00-4

CAS-No. : 127-18-4

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Skin sensitisation (Category 1), H317
Carcinogenicity (Category 2), H351
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

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

Warning

Hazard statement(s)

H315 Causes skin irritation.
H317 May cause an allergic skin reaction.
H319 Causes serious eye irritation.
H336 May cause drowsiness or dizziness.
H351 Suspected of causing cancer.
H411 Toxic to aquatic life with long lasting effects.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P272	Contaminated work clothing should not be allowed out of the workplace.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Perchloroethylene PCE
Formula	:	C ₂ Cl ₄
Molecular weight	:	165.83 g/mol
CAS-No.	:	127-18-4
EC-No.	:	204-825-9
Index-No.	:	602-028-00-4

Hazardous components

Component	Classification	Concentration
Tetrachloroethylene	Skin Irrit. 2; Eye Irrit. 2A; Skin Sens. 1; Carc. 2; STOT SE 3; Aquatic Acute 2; Aquatic Chronic 2; H315, H317, H319, H336, H351, H411	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**8.1 Control parameters****Components with workplace control parameters**

Component	CAS-No.	Value	Control parameters	Basis
Tetrachloroethylene	127-18-4	TWA	25.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		STEL	100.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		Potential Occupational Carcinogen Minimize workplace exposure concentrations. See Appendix A		
		See Table Z-2		
		TWA	100.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	200.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Peak	300.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		TWA	25 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		STEL	100 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		Potential Occupational Carcinogen Minimize workplace exposure concentrations. See Appendix A		
		See Table Z-2		

		TWA	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Peak	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		TWA	25 ppm 170 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	100 ppm 685 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	300 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	25 ppm 170 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Tetrachloroethylene	127-18-4	Tetrachloroethylene	3ppm	In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Prior to shift (16 hours after exposure ceases)			
		Tetrachloroethylene	0.5000 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		Prior to shift (16 hours after exposure ceases)			
		Tetrachloroethylene	3ppm	In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
		Prior to shift (16 hours after exposure ceases)			
		Tetrachloroethylene	0.5 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		Prior to shift (16 hours after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.2 mm

Break through time: 49 min

Material tested: Dermatril® P (KCL 743 / Aldrich Z677388, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: liquid, clear
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -22 °C (-8 °F) - lit. |
| f) Initial boiling point and boiling range | 121 °C (250 °F) - lit. |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 25.3 hPa (19.0 mmHg) at 25.0 °C (77.0 °F)
17.3 hPa (13.0 mmHg) at 20.0 °C (68.0 °F) |
| l) Vapour density | No data available |
| m) Relative density | 1.623 g/cm ³ at 25 °C (77 °F) |
| n) Water solubility | 0.15 g/l at 25 °C (77 °F) |
| o) Partition coefficient: n-octanol/water | log Pow: 2.53 at 23 °C (73 °F) |
| p) Auto-ignition 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

Surface tension 32.1 mN/m at 20 °C (68 °F)

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

Strong oxidizing agents, Strong bases

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - female - 3,385 mg/kg
(OECD Test Guideline 401)

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Skin irritation - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Mild eye irritation - 24 h

Respiratory or skin sensitisation

- Mouse

Result: May cause sensitisation by skin contact.
(OECD Test Guideline 429)

Germ cell mutagenicity

Hamster

ovary

Result: negative

OECD Test Guideline 474

Mouse - male

Result: negative

Carcinogenicity

Limited evidence of carcinogenicity in animal studies

IARC: 2A - Group 2A: Probably carcinogenic to humans (Tetrachloroethylene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Tetrachloroethylene)

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

Repeated dose toxicity Mouse - female - Oral - LOAEL : 390 mg/kg

RTECS: KX3850000

narcosis, Liver injury may occur., Kidney injury may occur.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish flow-through test LC50 - Oncorhynchus mykiss (rainbow trout) - 5 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 7.50 mg/l - 48 h

Toxicity to algae static test EC50 - Skeletonema costatum - > 16 mg/l - 7 h

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 d
Result: 11 % - Not readily biodegradable.
(OECD Test Guideline 301C)

12.3 Bioaccumulative potential

Bioaccumulation Lepomis macrochirus (Bluegill) - 21 d
- 0.00343 mg/l

Bioconcentration factor (BCF): 49

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 1897 Class: 6.1 Packing group: III
 Proper shipping name: Tetrachloroethylene
 Reportable Quantity (RQ): 100 lbs Reportable Quantity (RQ): 100 lbs
 Poison Inhalation Hazard: No

IMDG

UN number: 1897 Class: 6.1 Packing group: III EMS-No: F-A, S-A
 Proper shipping name: TETRACHLOROETHYLENE
 Marine pollutant: yes

IATA

UN number: 1897 Class: 6.1 Packing group: III
 Proper shipping name: Tetrachloroethylene

15. REGULATORY INFORMATION**SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Tetrachloroethylene	127-18-4	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Reportable Quantity	: D039 lbs
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Massachusetts Right To Know Components

	CAS-No.	Revision Date
Tetrachloroethylene	127-18-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Tetrachloroethylene	127-18-4	2007-07-01

	CAS-No.	Revision Date
Tetrachloroethylene	127-18-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Tetrachloroethylene	127-18-4	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Tetrachloroethylene	127-18-4	2007-09-28

16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity

Eye Irrit.	Eye irritation
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.
H401	Toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.11

Revision Date: 06/28/2017

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 05/28/2017
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Thallium

Product Number : 277932
Brand : Aldrich
Index-No. : 081-001-00-3

CAS-No. : 7440-28-0

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

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 2), H300
Acute toxicity, Inhalation (Category 2), H330
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H300 + H330

Fatal if swallowed or if inhaled

H412

Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P260

Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.

P264

Wash skin thoroughly after handling.

P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P284	Wear respiratory protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	TI
Molecular weight	:	204.38 g/mol
CAS-No.	:	7440-28-0
EC-No.	:	231-138-1
Index-No.	:	081-001-00-3

Hazardous components

Component	Classification	Concentration
Thallium		
	Acute Tox. 2; Aquatic Acute 3; Aquatic Chronic 3; H300 + H330, H412	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

- 5.2 Special hazards arising from the substance or mixture**
thallium oxides
- 5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.
- 5.4 Further information**
No data available

6. ACCIDENTAL RELEASE MEASURES

- 6.1 Personal precautions, protective equipment and emergency procedures**
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.
- 6.2 Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
- 6.3 Methods and materials for containment and cleaning up**
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.
- 6.4 Reference to other sections**
For disposal see section 13.

7. HANDLING AND STORAGE

- 7.1 Precautions for safe handling**
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combu formation should be taken into consideration before additional processing
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.
- 7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place.
- 7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

- 8.1 Control parameters**
Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Thallium	7440-28-0	TWA	0.100000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Alopecia Adopted values or notations enclosed are those for which changes are proposed in the NIC 2010 Revision or addition to the notice of intended changes See Notice of Intended Changes (NIC) Danger of cutaneous absorption		
		TWA	0.020000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Peripheral neuropathy Gastrointestinal damage 2015 Adoption Danger of cutaneous absorption		
		TWA	0.020000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Peripheral neuropathy Gastrointestinal damage		

		Danger of cutaneous absorption varies		
		TWA	0.1 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.02 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Peripheral neuropathy Gastrointestinal damage Danger of cutaneous absorption varies		
		TWA	0.1 mg/m ³	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (EN 143) respirator cartridges as a backup to engineering controls. If th full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance

Form: granular

	Colour: light grey
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 303 °C (577 °F) - lit.
f) Initial boiling point and boiling range	1,457 °C (2,655 °F) - lit.
g) Flash point	()Not applicable
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition 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

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

Air sensitive.

10.5 Incompatible materials

Strong acids, Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - thallium oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available(Thallium)
Dermal: No data available(Thallium)
No data available(Thallium)

Skin corrosion/irritation

No data available(Thallium)

Serious eye damage/eye irritation

No data available(Thallium)

Respiratory or skin sensitisation

No data available(Thallium)

Germ cell mutagenicity

No data available(Thallium)

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

Possible risk of congenital malformation in the fetus.(Thallium)

No data available(Thallium)

Specific target organ toxicity - single exposure

No data available(Thallium)

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available(Thallium)

Additional Information

RTECS: XG3425000

The most characteristic symptom of thallium exposure is alopecia (loss of impairment of nail growth often resulting in the appearance of crescent-s Other symptoms in acute poisoning relate chiefly to the gastrointestinal system. Acute poisoning results in swelling of the feet and legs, arthral the hands and feet, mental confusion, polyneuritis with severe pain in th angina-like pains, nephritis, wasting and weakness, and lymphocytosis and peripheral nervous system abnormalities may persist including ataxia, tre disorders, memory loss, and psychoses may develop., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.(Thallium)

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence(Thallium)

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - Cyprinodon variegatus (sheepshead minnow) - 21.0 mg/l - 96.0 h(Thallium)
mortality NOEC - Cyprinodon variegatus (sheepshead minnow) - 14.0 mg/l - 96.0 h(Thallium)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(Thallium)

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chem scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3288 Class: 6.1 Packing group: II
Proper shipping name: Toxic solid, inorganic, n.o.s. (Thallium)
Reportable Quantity (RQ) : 1000 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 3288 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, INORGANIC, N.O.S. (Thallium)

IATA

UN number: 3288 Class: 6.1 Packing group: II
Proper shipping name: Toxic solid, inorganic, n.o.s. (Thallium)

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Thallium	7440-28-0	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Thallium	7440-28-0	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Thallium	7440-28-0	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Thallium	7440-28-0	2007-07-01

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H300	Fatal if swallowed.
H300 + H330	Fatal if swallowed or if inhaled
H330	Fatal if inhaled.
H402	Harmful to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	4
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	4
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1

Revision Date: 05/28/2017

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 05/28/2017
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Vanadium(V) oxide

Product Number : 221899
Brand : Aldrich
Index-No. : 023-001-00-8

CAS-No. : 1314-62-1

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 Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

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
Serious eye damage (Category 1), H318
Germ cell mutagenicity (Category 2), H341
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Specific target organ toxicity - repeated exposure (Category 1), H372
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)
H302 + H332 : Harmful if swallowed or if inhaled

H318	Causes serious eye damage.
H335	May cause respiratory irritation.
H341	Suspected of causing genetic defects.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H411	Toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + 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.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	O ₅ V ₂
Molecular weight	:	181.88 g/mol
CAS-No.	:	1314-62-1
EC-No.	:	215-239-8
Index-No.	:	023-001-00-8

Hazardous components

Component	Classification	Concentration
Vanadium pentoxide	Acute Tox. 4; Eye Dam. 1; Muta. 2; Repr. 2; STOT SE 3; STOT RE 1; Aquatic Acute 2; Aquatic Chronic 2; H302 + H332, H318, H335, H341, H361, H372, H411	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Vanadium/vanadium oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combu formation should be taken into consideration before additional processing

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Vanadium pentoxide	1314-62-1	C	0.100000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		C	0.500000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Ceiling limit is to be determined from breathing-zone air samples.		
		TWA	0.050000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Lower Respiratory Tract irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		C	0.050000 mg/m3	USA. NIOSH Recommended Exposure Limits
		15 minute ceiling value		
		C	0.050000 mg/m3	USA. NIOSH Recommended Exposure Limits
		15 minute ceiling value		
		C	0.100000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Ceiling limit is to be determined from breathing-zone air samples.		
		C	0.500000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Ceiling limit is to be determined from breathing-zone air samples.		
		C	0.050000 mg/m3	USA. NIOSH Recommended Exposure Limits
		15 minute ceiling value		
		C	0.050000 mg/m3	USA. NIOSH Recommended Exposure Limits
		15 minute ceiling value		
		C	0.050000 mg/m3	USA. NIOSH Recommended Exposure Limits
		15 minute ceiling value		
		C	0.050000 mg/m3	USA. NIOSH Recommended Exposure Limits
		15 minute ceiling value		
		TWA	0.05 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Lower Respiratory Tract irritation Confirmed animal carcinogen with unknown relevance to humans		
		C	0.1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Ceiling limit is to be determined from breathing-zone air samples.		

		C	0.5 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Ceiling limit is to be determined from breathing-zone air samples.		
		C	0.05 mg/m ³	USA. NIOSH Recommended Exposure Limits
		15 minute ceiling value		
		C	0.05 mg/m ³	USA. NIOSH Recommended Exposure Limits
		15 minute ceiling value		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Vanadium pentoxide	1314-62-1	Vanadium	0.0500 mg/g	In urine	
	Remarks	End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (EN 143) respirator cartridges as a backup to engineering controls. If th full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance	Form: solid
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 690 °C (1274 °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, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	3.35 g/cm ³ at 25 °C (77 °F)
n) Water solubility	904 g/l at 20 °C (68 °F) - OECD Test Guideline 105
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	The substance or mixture is not classified as oxidizing.

9.2 Other safety information

Solubility in other solvents	Ethanol - insoluble
------------------------------	---------------------

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 acids

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Vanadium/vanadium oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2) Vanadium pentoxide

LC50 Inhalation - Rat - female - 4 h - 2.21 mg/l (Vanadium pentoxide)

(OECD Test Guideline 403)

LC50 Dermal - Rat - > 2,500 mg/kg (Vanadium pentoxide)

(OECD Test Guideline 402)

No data available (Vanadium pentoxide)

Skin corrosion/irritation

Skin - in vitro assay (Vanadium pentoxide)

Result: No skin irritation

Serious eye damage/eye irritation

Eyes - Rabbit (Vanadium pentoxide)

Result: Risk of serious damage to eyes.

(OECD Test Guideline 405)

Respiratory or skin sensitisation

No data available (Vanadium pentoxide)

Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects. (Vanadium pentoxide)

In vitro tests showed mutagenic effects (Vanadium pentoxide)

Carcinogenicity

No data available (Vanadium pentoxide)

(Vanadium pentoxide)

(Vanadium pentoxide)

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Vanadium pentoxide)

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Vanadium pentoxide)

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

Possible risk of congenital malformation in the fetus. (Vanadium pentoxide)

Suspected human reproductive toxicant (Vanadium pentoxide)

No data available (Vanadium pentoxide)

Specific target organ toxicity - single exposure

May cause respiratory irritation. (Vanadium pentoxide)

Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Specific target organ toxicity - repeated exposure

Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard

No data available(Vanadium pentoxide)

Additional Information

RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.(Vanadium pentoxide)

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence(Vanadium pentoxide)

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish LC50 - Oncorhynchus mykiss (rainbow trout) - 5.2 mg/l - 96.0 h(Vanadium pentoxide)

Toxicity to daphnia and other aquatic invertebrates LC50 - Daphnia magna (Water flea) - 1.52 mg/l - 48 h(Vanadium pentoxide)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(Vanadium pentoxide)

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

Toxic to aquatic life with long lasting effects.

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chem scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 2862 Class: 6.1 Packing group: III

Proper shipping name: Vanadium pentoxide

Reportable Quantity (RQ) : 1000 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 2862 Class: 6.1 Packing group: III

EMS-No: F-A, S-A

Proper shipping name: VANADIUM PENTOXIDE

Marine pollutant : yes

IATA

UN number: 2862 Class: 6.1 Packing group: III
Proper shipping name: Vanadium pentoxide

15. REGULATORY INFORMATION

SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Vanadium pentoxide	1314-62-1	2007-07-01

SARA 313 Components

	CAS-No.	Revision Date
Vanadium pentoxide	1314-62-1	2007-07-01

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Vanadium pentoxide	1314-62-1	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Vanadium pentoxide	1314-62-1	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Vanadium pentoxide	1314-62-1	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Vanadium pentoxide	1314-62-1	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Vanadium pentoxide	1314-62-1	2007-09-28

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Vanadium pentoxide	1314-62-1	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H302	Harmful if swallowed.
H302 + H332	Harmful if swallowed or if inhaled
H318	Causes serious eye damage.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H341	Suspected of causing genetic defects.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.

H411 Toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard: 3
Chronic Health Hazard: *
Flammability: 0
Physical Hazard 0

NFPA Rating

Health hazard: 3
Fire Hazard: 0
Reactivity Hazard: 0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1

Revision Date: 05/28/2017

Print Date: 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Xylenes

Product Number : 214736
Brand : Aldrich
Index-No. : 601-022-00-9

CAS-No. : 1330-20-7

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
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 3), H226
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Specific target organ toxicity - repeated exposure, Inhalation (Category 2), Central nervous system, Liver, Kidney, H373
Aspiration hazard (Category 1), H304
Acute aquatic toxicity (Category 2), H401

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H226 Flammable liquid and vapour.
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H332 Harmful if inhaled.
H335 May cause respiratory irritation.
H373 May cause damage to organs (Central nervous system, Liver, Kidney) through prolonged or repeated exposure if inhaled.
H401 Toxic to aquatic life.

Precautionary statement(s)	
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P314	Get medical advice/ attention if you feel unwell.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Xylene mixture of isomers
Formula	:	C ₈ H ₁₀
Molecular weight	:	106.17 g/mol
CAS-No.	:	1330-20-7
EC-No.	:	215-535-7
Index-No.	:	601-022-00-9
Registration number	:	01-2119488216-32-XXXX

Hazardous components

Component	Classification	Concentration
Xylene	Flam. Liq. 3; Acute Tox. 4; Skin Irrit. 2; STOT SE 3; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; H226, H304, H315, H332, H335, H373, H401	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Xylene	1330-20-7	STEL	150 ppm 655 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	300 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	100 ppm 435 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		TWA	100 ppm 435 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	The value in mg/m ³ is approximate.		
		TWA	100 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	150 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
	-	Methylhippuric acids	1.5g/g creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 35 min
Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: clear, liquid
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | < 0 °C (< 32 °F) |
| f) Initial boiling point and boiling range | 137 - 140 °C (279 - 284 °F) - lit. |
| g) Flash point | 25 °C (77 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 7 %(V)
Lower explosion limit: 1.1 %(V) |
| k) Vapour pressure | 24 hPa (18 mmHg) at 37.70 °C (99.86 °F) |
| l) Vapour density | 3.67 - (Air = 1.0) |
| m) Relative density | 0.86 g/mL at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition | No data available |

temperature

- 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

Relative vapour density 3.67 - (Air = 1.0)

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

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male - 3,523 mg/kg

Remarks: (ECHA)

Skin corrosion/irritation

Skin - Rabbit

Result: Irritations

Remarks: (IUCLID)

Drying-out effect resulting in rough and chapped skin. After long-term exposure to the chemical: Dermatitis

Serious eye damage/eye irritation

Respiratory or skin sensitisation

In animal experiments: - Mouse

Result: Does not cause skin sensitisation.

(OECD Test Guideline 429)

Germ cell mutagenicity

Mutagenicity (mammal cell test): chromosome aberration.

Result: negative

(National Toxicology Program)

Ames test

Salmonella typhimurium

Result: negative

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

Specific target organ toxicity - single exposure

May cause respiratory irritation. - Respiratory system

Acute oral toxicity - Gastrointestinal disturbance

Acute inhalation toxicity - mucosal irritations, Cough, Shortness of breath, Possible damages:, damage of respiratory tract, Inhalation may lead to the formation of oedemas in the respiratory tract.

Specific target organ toxicity - repeated exposure

May cause damage to organs through prolonged or repeated exposure. - Central nervous system, Liver, Kidney

Aspiration hazard

Aspiration hazard, Aspiration may cause pulmonary oedema and pneumonitis.

Additional Information

RTECS: Not available

Blurred vision, Incoordination., Headache, Nausea, Vomiting, Dizziness, Weakness, anemia, Prolonged or repeated exposure to skin causes defatting and dermatitis.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After absorption:

Systemic effects:

Headache, somnolence, Dizziness, euphoria, agitation, spasms, respiratory paralysis, Unconsciousness, narcosis, inebriation

Effect potentiated by: ethanol

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

12.2 Persistence and degradability

12.3 Bioaccumulative potential

12.4 Mobility in soil

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Contact a licensed professional waste disposal service to dispose of this material. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1307 Class: 3 Packing group: III
Proper shipping name: Xylenes
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1307 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: XYLENES

IATA

UN number: 1307 Class: 3 Packing group: III
Proper shipping name: Xylenes

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Xylene	1330-20-7	1993-04-24

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Xylene	1330-20-7	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Xylene	1330-20-7	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Xylene	1330-20-7	1993-04-24

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Asp. Tox.	Aspiration hazard
Flam. Liq.	Flammable liquids
H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H373	May cause damage to organs (/*_2ORG_REP_INH/*/) through prolonged or repeated exposure if inhaled.
H401	Toxic to aquatic life.
Skin Irrit.	Skin irritation

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the

product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.10

Revision Date: 08/06/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 05/28/2017
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Zinc
Product Number : 324930
Brand : Aldrich
Index-No. : 030-001-00-1
CAS-No. : 7440-66-6

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 Street
ST. LOUIS MO 63103
UNITED STATES
Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Pyrophoric solids (Category 1), H250
Self-heating substances and mixtures (Category 1), H251
Substances and mixtures, which in contact with water, emit flammable gases (Category 1), H260
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H250 Catches fire spontaneously if exposed to air.
H251 Self-heating: may catch fire.
H260 In contact with water releases flammable gases which may ignite spontaneously.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)	
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P222	Do not allow contact with air.
P223	Do not allow contact with water.
P231 + P232	Handle under inert gas. Protect from moisture.
P235 + P410	Keep cool. Protect from sunlight.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391	Collect spillage.
P402 + P404	Store in a dry place. Store in a closed container.
P407	Maintain air gap between stacks/ pallets.
P413	Store bulk masses greater than .? kg/ .? lbs at temperatures not exceeding .? °C/ .? °F.
P420	Store away from other materials.
P422	Store contents under inert gas.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Combustible dust

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: Zn
Molecular weight	: 65.39 g/mol
CAS-No.	: 7440-66-6
EC-No.	: 231-175-3
Index-No.	: 030-001-00-1

Hazardous components

Component	Classification	Concentration
Zinc powder (pyrophoric)		
	Pyr. Sol. 1; Self-heat. 1; Water-react. 1; Aquatic Acute 1; Aquatic Chronic 1; H250, H251, H260, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

- 4.2 Most important symptoms and effects, both acute and delayed**
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11
- 4.3 Indication of any immediate medical attention and special treatment needed**
No data available
-

5. FIREFIGHTING MEASURES

- 5.1 Extinguishing media**
Suitable extinguishing media
Dry powder
- 5.2 Special hazards arising from the substance or mixture**
Zinc/zinc oxides
- 5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.
- 5.4 Further information**
No data available
-

6. ACCIDENTAL RELEASE MEASURES

- 6.1 Personal precautions, protective equipment and emergency procedures**
Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.
- 6.2 Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
- 6.3 Methods and materials for containment and cleaning up**
Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. Keep in suitable, closed containers for disposal. Contain spillage, pick up with an electrically protected vacuum cleaner or by wet-brushing and transfer to a container for disposal according to local regulations (see section 13).
- 6.4 Reference to other sections**
For disposal see section 13.
-

7. HANDLING AND STORAGE

- 7.1 Precautions for safe handling**
Further processing of solid materials may result in the formation of combu formation should be taken into consideration before additional processing
Provide appropriate exhaust ventilation at places where dust is formed.Keep away from sources of ignition - No smoking.
For precautions see section 2.2.
- 7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place.
Never allow product to get in contact with water during storage.

Keep in a dry place.
- 7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated
-

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

- 8.1 Control parameters**
Components with workplace control parameters
Contains no substances with occupational exposure limit values.
Hazardous components without workplace control parameters

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Protective gloves against thermal risks

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Flame retardant protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (EN 143) respirator cartridges as a backup to engineering controls. If th full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|--|---|
| a) Appearance | Form: powder
Colour: grey |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 420 °C (788 °F) - lit. |
| f) Initial boiling point and boiling range | 907 °C (1665 °F) - lit. |
| g) Flash point | ()No data available |
| h) Evaporation rate | No data available |

- | | |
|---|---|
| i) Flammability (solid, gas) | May form combustible dust concentrations in air. |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 1 hPa at 487 °C (909 °F) |
| l) Vapour density | No data available |
| m) Relative density | 7.133 g/mL at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | log Pow: 5 |
| p) Auto-ignition temperature | The substance or mixture is classified as self heating with the category 1.,
The substance or mixture is pyrophoric with the category 1. |
| 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

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

Reacts violently with water.

10.4 Conditions to avoid

Exposure to moisture

10.5 Incompatible materials

Strong acids and oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Zinc/zinc oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available(Zinc powder (pyrophoric))

Inhalation: No data available(Zinc powder (pyrophoric))

Dermal: No data available(Zinc powder (pyrophoric))

No data available(Zinc powder (pyrophoric))

Skin corrosion/irritation

No data available(Zinc powder (pyrophoric))

Serious eye damage/eye irritation

No data available(Zinc powder (pyrophoric))

Respiratory or skin sensitisation

Did not cause sensitisation on laboratory animals.(Zinc powder (pyrophoric))

Germ cell mutagenicity

No data available(Zinc powder (pyrophoric))

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available(Zinc powder (pyrophoric))

No data available(Zinc powder (pyrophoric))

Specific target organ toxicity - single exposure

No data available(Zinc powder (pyrophoric))

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available(Zinc powder (pyrophoric))

Additional Information

RTECS: ZG8600000

chills, dry throat, sweet taste, Fever, Cough, Nausea, Vomiting, Weakness(Zinc powder (pyrophoric))
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.(Zinc powder (pyrophoric))

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish LC50 - Cyprinus carpio (Carp) - 450.0 µg/l - 96.0 h(Zinc powder (pyrophoric))

Toxicity to daphnia and other aquatic invertebrates LC50 - Daphnia magna (Water flea) - 0.068 mg/l - 48 h(Zinc powder (pyrophoric))

mortality NOEC - Daphnia (water flea) - 0.101 - 0.14 mg/l - 7 d(Zinc powder (pyrophoric))

12.2 Persistence and degradability**12.3 Bioaccumulative potential**

Bioaccumulation Algae - 7 d
at 16 °C - 5 µg/l(Zinc powder (pyrophoric))

Bioconcentration factor (BCF): 466

12.4 Mobility in soil

No data available(Zinc powder (pyrophoric))

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Burn in a chemical incinerator equipped with an afterburner and scrubber b highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1436 Class: 4.3 (4.2) Packing group: II
Proper shipping name: Zinc powder
Reportable Quantity (RQ) : 1000 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1436 Class: 4.3 (4.2) Packing group: II EMS-No: F-G, S-O
Proper shipping name: ZINC POWDER
Marine pollutant : yes

IATA

UN number: 1436 Class: 4.3 (4.2) Packing group: II
Proper shipping name: Zinc powder

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Zinc powder (pyrophoric)	7440-66-6	1993-04-24

SARA 311/312 Hazards

Reactivity Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Zinc powder (pyrophoric)	7440-66-6	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Zinc powder (pyrophoric)	7440-66-6	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Zinc powder (pyrophoric)	7440-66-6	1993-04-24

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H250	Catches fire spontaneously if exposed to air.
H251	Self-heating: may catch fire.
H260	In contact with water releases flammable gases which may ignite spontaneously.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	
Flammability:	3
Physical Hazard	1

NFPA Rating

Health hazard:	0
Fire Hazard:	3
Reactivity Hazard:	1
Special hazard.I:	W

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 05/28/2017

Print Date: 06/28/2019

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

Quality Assurance Project Plan

**1510 Broadway LLC
Site #C224280**

**1510 Broadway Dry Cleaner Site
Brooklyn, New York**

1.0 PROJECT DESCRIPTION

This document presents the Quality Assurance Project Plan (QAPP) for remediation of the proposed development at 1510 Broadway, Brooklyn, New York as per the Remedial action work plan (RAWP).

The Site, which is the subject of this RAWP, is approximately 0.46-acres. The Site property is now identified on the city tax map as Block 1489, Lot 11 and is located at 1510 Broadway in the Bedford-Stuyvesant / Brownsville section of Brooklyn, New York. The Site is depicted on a United States Geological Survey (USGS) Topographic Map (**Figure 2.1**) and Survey Map (**Figure 2.2**) of the remedial investigation report.

The Site is bounded to the north by Jefferson Avenue beyond which lies transit system sub-station; to the south by an apparent vacant building and Hancock Street, beyond which lies a medical center and residential properties; to the east by Broadway and an elevated subway (J and Z line) tracks, beyond which lies commercial properties; and to the west by the Saratoga Avenue, beyond which lies residential properties.

The proposed development consists of one eight-story structure with a partial cellar level. The cellar will contain mechanical spaces and building storage. The first floor will contain the commercial retail space, a residential lobby, five residential units, a residential recreational area, laundry and bike rooms, and additional mechanical and building storage rooms. Residential units will occupy the second through eighth floors, with an exterior residential recreation courtyard proposed on the second floor.

2.0 PROJECT ORGANIZATION

The RAWP will be conducted by Soils Engineering Services, Inc. (SESI), on behalf of 1510 Broadway LLC. The organization of SESI's key project management and field staff, and respective areas of responsibility, is presented below.

2.1 Project Principal

Fuad Dahan PhD, P.E.

Provide technical and administrative oversight and guidance throughout the project, assist in securing company resources, participate in technical review of deliverables, and attend key meetings as needed.

2.2 Principal Engineer

Fuad Dahan, PhD, P.E.

Provide technical guidance and review of reports, analytical data. Will have key involvement in screening and development of remedial alternatives.

2.3 Project Manager

Fuad Dahan, PhD, P.E.

Responsible for maintaining the day-to-day schedule for completing the fieldwork and deliverables according to BCP program requirements and client expectations.

2.4 Remedial Investigation Program Manager

Todd Kelly

Responsible for coordinating and directing field efforts of SESI staff and subcontractors, and for maintaining that work is done according to QAPP specifications.

2.5 Field Team Leader

Jonathon Stuart

Responsible for overseeing field work during the RI and IRM, including observing subcontractors, maintaining field notes, and collecting samples of various environmental media, in accordance with the NYSDEC-approved Work Plan.

2.5 Quality Assurance Officer

Steven Gustems, PG

Responsible for will reviewing sampling procedures and certify that the data was collected and analyzed using the appropriate procedures.

3.0 QA/QC OBJECTIVES FOR MEASUREMENT OF DATA

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. For analysis of samples where Analytical Service Protocol (ASP 2005) Category B deliverables are required.

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 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.

3.1 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.

3.2 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. Specific cleaning techniques are described in the Field Sampling Procedure. 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 7/85 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.

3.3 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.

3.4 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 titrametric

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 be a minimum of 1 duplicate for every 20 samples per each medium sampled. The inclusion and frequency of analysis of field blanks will be on the order of one per every 20 samples (soil) but not more than one per day. 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 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.

4.0 SAMPLING PROCEDURES

4.1 SAMPLING PROGRAM

The sampling program for this project will include soil, groundwater and soil vapor. Soil samples will be collected from split spoon sampling or macro-core devices retrieved from soil borings. Groundwater samples will be collected from groundwater monitoring wells using low flow purging techniques. Soil vapor samples will be collected from vapor points screened in the vadose zone using Summa Canisters.

4.1.1 Drilling/Sampling Procedures

Soil and groundwater samples will be collected by means of a soil boring program. Soil borings shall be completed using the hollow stem auger drilling methods, direct push methods, or rotary drilling methods, whichever methods are determined to be best suited to site conditions by the SESI project manager and SESI field team leader.

Soil samples will be collected from soil borings and analyzed in accordance with the NYSDEC-approved Work Plan. Temporary monitoring wells for groundwater sample

collection will be installed in select completed soil borings. Either hollow stem auger (HSA) or direct push drilling methods may be utilized for monitoring well completion.

Samples of the encountered overburden materials shall be collected continuously during drilling so that a complete soil profile is examined and described by the SESI field geologist. The sampling method employed shall be ASTM D-1586/Split Barrel Sampling using a standard 2-foot long, 2-inch outside diameter split- spoon sampler with a 140-pound hammer, in cases where HSA methods are used. Upon retrieval of the sampling barrel, the collected sample shall be placed in glass jars and labeled, stored on site (on ice in a cooler if necessary), and transmitted to the appropriate testing laboratory or storage facility. Chain-of-custody procedures will be practiced following Section 15, EPA-600/4-82-029, Handbook for Sampling and Sample Preservation of Water and Waste Waters.

A geologist or engineer will be on site during the drilling operations to fully describe each soil sample, following the New York State Soil Description Procedure, and to retain representative portions of each sample.

The drilling contractor will be responsible for obtaining accurate and representative samples, informing the geologist of changes in drilling pressure, keeping a separate general log of soils encountered including blow counts [i.e., the number of blows from a soil sampling drive weight (140 pounds)] required to drive the split-spoon sampler in 6-inch increments and installing monitoring wells to levels directed by the supervising geologist following specifications further outlined in this protocol.

4.1.2 Monitoring Well Completion

Monitoring wells will be constructed of 0.010-inch slot size PVC well screen and riser casing. Other materials utilized for completion will be washed silica sand (Q-Rock No. 4 or approved equivalent) bentonite grout, Portland cement, and a protective steel locking well casing and cap with locks. The depth of the wells will be determined based on the depth to water, type of contaminant and field conditions encountered.

The monitoring well installation method for wells installed within unconsolidated sediments shall be to place the screen and riser assembly into the casing once the screen interval has been selected. At that time, a washed silica sand pack will be placed around the well screen if required to prevent screen plugging. If a sand pack is not warranted, the auger string will be pulled back to allow the native aquifer material to collapse 2 to 3 feet above the top of the screen. Bentonite pellets will then be added to the annulus between the casing and the inside auger to insure proper sealing. Cement/bentonite grout will continue to be added during the extraction of the augers until the entire aquifer thickness has been sufficiently sealed off from horizontal and/or vertical flow above the screened interval. During placement of sand and bentonite pellets, frequent measurements will be made to check the height of the sand pack and thickness of bentonite layers by a weighted drop tape measure.

A bolt-down protective curb box will be installed, flush with the ground, or steel "stick-up" protective casing and secured by a Portland cement seal. The cement seal shall extend

laterally at least 1 foot in all directions from the protective casing and shall slope gently away to drain water away from the well.

4.1.3 Well Development

All monitoring wells will be developed or cleared of all fine-grained materials and sediments that have settled in or around the well during installation so that the screen is transmitting representative portions of the groundwater. The development will be by one of two methods, pumping or bailing groundwater from the well until it yields relatively sediment-free water.

A decontaminated pump or bailer will be used and subsequently decontaminated after each use following procedures outlined in the Decontamination Protocol. Pumping or bailing will cease when the turbidity falls below 50 NTUs or until specific conductivity, pH, and temperature are stable (i.e., consecutive readings are within 10 percent with no overall upward or downward trends in measurements). Well development water will be disposed of on the ground surface at each well location or contained in drums as conditions warrant.

4.1.4 Decontamination

All drilling equipment and associated tools including augers, drill rods, sampling equipment, wrenches and any other equipment or tools that have come in contact with contaminated materials will be decontaminated before any drilling on site begins, between each well, and prior to removing any equipment from the site. The preferred decontamination procedure will be to scrape the equipment from any residual soils and then rinse with water and Alconox®. Every effort will be made to minimize the generation of contaminated water.

4.2 Groundwater Sampling Program.

4.2.1 Well Evacuation

Prior to sampling a monitoring well, the static water level will be recorded. All well data will be recorded on a field sampling record. The wells will be sampled in accordance with the USEPA guidelines for the Low Flow Purging Sampling (LFPS). The purpose of LFPS is to collect groundwater samples from monitoring wells that are representative of ambient groundwater conditions in the aquifer. The LFPS method reduces turbidity which is needed particularly when sampling for metals.

4.2.2 Sampling Procedure

The wells will be sampled using the LFPS technique. A flow rate of 100 ml to 250 ml per minute is used to purge the wells. Drawdown should not exceed 0.3 feet. QED bladder pumps are used for this method. The pump intake is lowered to the mid-point of the water column or as subsurface features such as bedrock fractures or more permeable zones warrant. At the initiation of low flow purging a water level is recorded as well as field parameters. Field parameters are then monitored every five minutes during low flow purging using a flow through cell. When three consecutive measurements of pH

differ by 0.1 units or less, with ORP within 10 mv or less, turbidity varies 10 percent or less, conductivity differs by 3 percent or less and dissolved oxygen by 10 percent or less, sampling may begin. Flow through cells are used so continuous real time readings are made. When the parameters stabilize the flow through cell is disconnected and sample bottles are filled directly from the tubing.

In addition to water samples collected from the monitoring wells, two types of "blanks" will be collected and submitted to the chemical laboratory for analyses. The blanks will consist of 40 ml VOA vials, as follows:

A trip blank will be prepared before the sample bottles are sent by the laboratory. It consists of a sample of distilled, deionized water which accompanies the other sample bottles into the field and back to the laboratory. A trip blank will be included with each shipment of samples where sampling and analysis for TCL volatiles is planned (water matrix only). The trip blank will be analyzed for TCL volatile organic compounds as a measure of the internal laboratory procedures and their effect on the results.

4.3 Soil Vapor Sampling

Soil vapor sampling will be conducted in accordance with NYSDOH Guidance for Evaluating Indoor Air Intrusion in New York State (October 2006). Soil vapor samples will be collected in the vadose zone from shallow (5 feet) well points. Each well point will be installed in a shallow boring drilled either by hand-operated equipment (e.g. hand auger or percussion hammer drill), or by a small truck-mounted drill rig. Drilling equipment used shall be based on soil conditions, and the method that provides the most practical approach.

Each well point will consist of an inert sampling tube (polyethylene, stainless steel, or Teflon®) with a 6-inch screened section at the bottom through which soil vapors can be sampled. The screen slot size will be 0.0075 inches. A sampling zone will be created around the screened section by backfilling with 1 to 2 feet of porous coarse sand or glass beads, and at least three feet of bentonite will be placed above the porous sampling zone to form a seal from the surface. Native clean soil will be packed around the remaining annulus to the ground surface.

Each designated soil vapor sampling location will be purged of a minimum of three volumes using a low volume pump, and then attached to a regulator, and secured with a clamp. The regulator will then be attached to a 1-liter summa canister.

The regulator will be set to collect a soil vapor sample at a flow rate of less than 0.2 liters per minute. After the summa canister is filled, the valve will be closed.

Each canister will be listed according to a specific sample I.D. on a chain of custody form. Sample canisters will be delivered to the laboratory within 24 hours and analyzed for VOCs by method TO-15. The detection limit for VOCs will be 1 µg/m³ or less.

The soil vapor sampling effort will include the use inert helium tracer gas to verify that the soil vapor samples are not diluted by ambient air. The atmosphere around the sampling tube will be enriched with the tracer gas, and the soil vapor sample will be collected in the presence of the enriched tracer atmosphere. This will be accomplished by placing an inverted plastic pail over the sampling point and filling the pail with the tracer gas via a small tube penetrating the site of the pail. Refer to NYSDOH Guidance for Evaluating Indoor Air Intrusion in New York State (October 2006).

Weather conditions in the 48 hours prior to the test, and during the test, will be noted, including average wind speed, precipitation, temperature, and barometric pressure.

4.4 SAMPLE PRESERVATION AND SHIPMENT

Since all bottles will contain the necessary preservatives as shown in Table 4.1, they need only be filled. The 40 ml VOA vials shall be filled and free of air bubbles. The other bottles should be filled to within about 1 inch from the top.

The bottles will be sent from the laboratory in coolers which will be organized on a per site basis. Following sample collection, the bottles should be placed on ice in the shipping cooler. The samples will be cooled to 4°C, but not frozen.

Final packing and shipment of coolers will be performed in accordance with guidelines outlined in the ASP.

5.0 SAMPLE CUSTODY

The program for sample custody and sample transfer is in compliance with the NYSDEC-ASP, as periodically updated. If samples may be needed for legal purposes, chain-of-custody procedures, as defined by NEIC Policies and Procedures (USEPA-330/9-78-001-R, Revised June 1988) will be used. Sample chain-of-custody is initiated by the laboratory with selection and preparation of the sample containers. To reduce the chance for error, the number of personnel handling the samples should be minimized.

5.1 FIELD SAMPLE CUSTODY

A chain-of-custody record accompanies the samples from initial sample container selection and preparation at the laboratory, shipment to the field for sample containment and preservation, and return to the laboratory. Two copies of this record follow the samples to the laboratory. The laboratory maintains one file copy and the completed original is returned to the site inspection team. Individual sample containers provided by the laboratory are used for shipping samples. The shipping containers are insulated and ice is used to maintain samples at approximately 4°C until samples are returned and in the custody of the laboratory. All sample bottles within each shipping container are individually labeled and controlled. Samples are to be shipped to the laboratory within 24-48 hours of the day of collection depending on parameter holding times.

Each sample shipping container is assigned a unique identification number by the laboratory. This number is recorded on the chain-of-custody record and is marked with indelible ink on the outside of the shipping container. The field sampler will indicate the sample designation/location number in the space provided on the appropriate chain-of-custody form for each sample collected. The shipping container is closed and a seal provided by the laboratory is affixed to the latch. This seal must be broken to open the container, and this indicates possible tampering if the seal is broken before receipt at the laboratory. The laboratory will contact the site investigation team leader and the sample will not be analyzed if tampering is apparent.

5.2 LABORATORY SAMPLE CUSTODY

The site investigation team leader or Project Quality Assurance Officer notifies the laboratory of upcoming field sampling activities and the subsequent transfer of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped as well as the anticipated date of arrival.

The laboratory sample program meets the following criteria:

1. The laboratory has designated a sample custodian who is responsible for maintaining custody of the samples and for maintaining all associated records documenting that custody.
2. Upon receipt of the samples, the custodian will check the original chain-of-custody documents and compare them with the labeled contents of each sample container for correctness and traceability. The sample custodian signs the chain-of-custody record and records the date and time received.
3. Care is exercised to annotate any labeling or descriptive errors. In the event of discrepant documentation, the laboratory will immediately contact the site investigation team leader as part of the corrective action process. A qualitative assessment of each sample container is performed to note any anomalies, such as broken or leaking bottles. This assessment is recorded as part of the incoming chain-of-custody procedure.
4. The samples are stored in a secured area at a temperature of approximately 4°C until analyses are to commence.
5. A laboratory chain-of-custody record accompanies the sample or sample fraction through final analysis for control.
6. A copy of the chain-of-custody form will accompany the laboratory report and will become a permanent part of the project records.

5.3 FINAL EVIDENCE FILES

Final evidence files include all originals of laboratory reports and are maintained under documented control in a secure area.

A sample or an evidence file is under custody if:

- It is in your possession; it is in your view, after being in your possession.
- It was in your possession and you placed it in a secure area.
- It is in a designated secure area.

6.0 CALIBRATION PROCEDURES

Instruments and equipment used to gather, generate or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the appropriate manufacturer's specifications or project specific requirements. The procedures for instrument calibration, calibration verification, and the frequency of calibrations are described in the ASP. The calibration of instruments used for the determination of metals will be as described in the appropriate CLP standard operating procedures.

Calibration of other instruments required for measurements associated with these analyses will be in accordance with the manufacturer's recommendations and the standard operating procedures of the laboratory.

7.0 ANALYTICAL PROCEDURES

Analytical procedures shall conform to the most recent revision of the NYSDEC-ASP and are summarized on Table 7.1. In the absence of USEPA or NYSDEC guidelines, appropriate procedures shall be submitted for approval by NYSDEC prior to use.

The procedures for the sample preparation and analysis for organic compounds are as specified in the NYSDEC-ASP. Analytical cleanups are mandatory where matrix interferences are noted. No sample shall be diluted any more than 1 to 5. The sample shall be either re-extracted, re-sonicated, re-stream distilled, etc. or be subjected to any one analytical cleanup noted in SW846 or a combination thereof. The analytical laboratory shall expend such effort and discretion to demonstrate good laboratory practice and demonstrate an attempt to best achieve the method detection limit.

7.1 VOLATILE ORGANICS (VOA)

For the analysis of water samples for Target Compound List (TCL), volatile organic compounds (VOCs), no sample preparation is required. The analytical procedure for volatiles is detailed in NYSDEC-ASP (Volume I, Section D-I). A measured portion of the sample is placed in the purge and trap apparatus and the sample analysis is performed by gas chromatography/mass spectrometry for the first round. USEPA Method 8260 will be used, plus tentatively identified compounds (TICs). USEPA Methods 8010 or 8020 (gas chromatography with different detectors) will be used if subsequent rounds with lower limits of detection are warranted.

7.2 SEMI-VOLATILE ORGANIC COMPOUNDS

The extraction and analytical procedures used for preparation of water, soil and sediment samples for the analysis of the TCL semi-volatile organic compounds are

described in NYSDEC-ASP Volume I, Section D-III. USEPA Method 8270 will be used, plus tentatively identified compounds (TICs).

Instrument calibration, compound identification, and quantitation are performed as described in Section 6 of this document and in the NYSDEC-ASP.

7.3 PESTICIDE AND PCB COMPOUNDS

The sample preservation procedures for gas chromatography for pesticides and PCB's will be as described in the NYSDEC-ASP methods (Section D-IV). The analysis of standard mixes, blanks and spiked samples will be performed at the prescribed frequency with adherence to the 72-hour requirement described in the method.

7.4 METALS

Water, soil and waste samples will be analyzed for the metals listed in Table 7.1. The detection limits for these metals are as specified in the NYSDEC-ASP, Section D-V. The instrument detection limits will be determined using calibration standards and procedures specified in the NYSDEC-ASP. The detection limits for individual samples may be higher due to the sample matrix. The procedures for these analyses will be as described in the NYSDEC-ASP.

The analyses for metals will be performed by atomic absorption spectroscopy (AAS) or inductively-coupled plasma emission spectroscopy (ICPES), as specified in the ASP with regard to AAS flame analysis.

7.5 SITE SPECIFICITY OF ANALYSES

Work plans prepared for remedial investigation waste sites contain recommendations for the chemical parameters to be determined for each site. Thus, some or all of the referenced methods will apply to the analysis of samples collected at the individual waste sites. Analyses of Target Compound List (TCL) analytes will be performed on all samples.

TABLE 4.1 – SAMPLE CONTAINERIZATION

PARAMETER & ANALYTICAL METHOD	NO.	BOTTLE TYPE	PRESERVATIVE⁽¹⁾	HOLDING TIME
Aqueous Samples				
SVOCs (BNAs) – USEPA 8270C	2	1-liter amber glass bottle	None	7 days (until extraction) 40 days (extracted)
Pesticides – USEPA 8081A	2	1-liter amber glass bottle	None	7 days (until extraction) 40 days (extracted)
PCBs – USEPA 8082	2	1-liter amber glass bottle	None	7 days (until extraction) 40 days (extracted)
VOCs – USEPA 8260B	2	40 mL, glass vial with septum cap	Hydrochloric Acid to pH <2	14 days
Metals ⁽²⁾	1	1-liter, plastic bottle	Nitric acid to pH <2	180 days Mercury: 28 days
Cyanide – SM 4500-CN-E	1	1-liter, plastic	Sodium Hydroxide to pH >12	14 days
Soil, Sediment, Solid Waste Samples				
VOCs – USEPA 8260B	3	15-gram EnCore samplers	None	14 days
SVOCs (BNAs) – USEPA 8270C	1	4-oz. glass jar with Teflon lid	None	7 days (until extraction, 40 days extracted)
Pesticides – USEPA 8081A	1	4-oz. glass jar with Teflon lid	None	7 days (until extraction) 40 days (extracted)
PCBs – USEPA 8082	1	4-oz. glass jar with Teflon lid	None	7 days (until extraction) 40 days (extracted)
Metals ⁽²⁾	1	4-oz. glass jar with Teflon lid	None	180 days Cyanide: 14 days Mercury: 28 days
Soil Vapor / Indoor Air Samples				
VOCs – USEPA TO-15	1	Summa Canister	None	30 days

(1) All samples will be preserved with ice during collection and shipment.

(2) From verified time of sample receipt by the analytical laboratory (within 24 to 48 hours of collection).

(3) A complete list of compounds is provided on Table 7.1.

TABLE 4.2 – SAMPLING PROCEDURE FOR MONITORING WELLS USING VOLUME AVERAGED PURGING

1. Initial static water level recorded with an electric contact probe accurate to the nearest 0.1 foot.
2. Sampling device and electric contact probe decontaminated.
 - a. Sampling device and probe are rinsed with pesticide-grade methanol and distilled water.
 - b. Methanol is collected into a large funnel which empties into a five- gallon container.
3. Sampling device lowered into well.
 - a. Bailer lowered by dedicated PVC or polypropylene line.
4. Sample taken.
 - a. Sample is poured slowly from the open end of the bailer and the sample bottle tilted so that aeration and turbulence are minimized.
 - b. Duplicate sample is collected when appropriate.
5. Samples are capped, labeled and placed in laboratory coolers with ice packs or bagged ice.
6. All equipment is cleaned with successive rinses of pesticide-grade methanol and distilled water.
 - a. Dedicated line is disposed of or left at well site.
7. Equipment/wash blanks are collected when non-dedicated sampling equipment is used.
8. Chain-of-custody forms are completed in triplicate.
 - a. The original and one carbon copy are put into a zip-lock bag and placed into the cooler.
9. The original will be returned following sample analysis.
 - a. A second carbon copy is kept on file.
10. Cooler is sealed with strapping tape and chain-of-custody seals to assure integrity and to prevent tampering of sample.

TABLE 4.3 – SAMPLING PROCEDURE FOR MONITORING WELLS USING LOW-STEPPED (LOW-FLOW) METHODS

1. Initial static water level recorded with an electric contact probe accurate to the nearest 0.1 foot.
2. Sampling device is lowered into well. Slowly lower the pump, safety cable, tubing and electrical lines into the well to the depth specified for that well. Pump intake must be no less than 2 feet from the bottom of the well to prevent disturbance and resuspension of sediments which may be at the bottom of the well.
3. Measure water level again: Before starting the pump, measure the water level again with the pump in the well. Leave the water level measuring device in the well.
4. Purge Well: Start pumping the well at 200 to 500 milliliters per minute (ml/min). The water level should be monitored approximately every five minutes. Ideally, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 ft or less). Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to ensure stabilization of the water level. As noted above, care should be taken to maintain pump suction and to avoid entrainment of air in the tubing. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment.
5. Monitor Indicator Parameters: During purging of the well, monitor and record the field indicator parameters (turbidity, temperature, specific conductance, pH, Eh, and DO) approximately every five minutes. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows (Puls and Barcelona, 1996):
 - a. 0.1 for pH
 - b. 3% for specific conductance (conductivity)
 - c. 10 mv for redox potential
 - d. 10% for DO and turbidity
6. Dissolved oxygen and turbidity usually require the longest time to achieve stabilization. The pump must not be removed from the well between purging and sampling.
7. Collect Samples: Collect samples at a flow rate between 100 and 250 ml/min and such that drawdown of the water level within the well does not exceed the maximum allowable drawdown of 0.3 ft. VOC samples must be collected first and directly into sample containers. All sample containers should be filled with minimal turbulence by allowing the ground water to flow from the tubing gently down the inside of the container.

8. Ground water samples to be analyzed for volatile organic compounds (VOCs) require pH adjustment. The appropriate EPA Program Guidance should be consulted to determine whether pH adjustment is necessary. If pH adjustment is necessary for VOC sample preservation, the amount of acid to be added to each sample vial prior to sampling should be determined, drop by drop, on a separate and equal volume of water (e.g., 40 ml). Groundwater purged from the well prior to sampling can be used for this purpose.
9. Remove Pump and Tubing: After collection of the samples, the tubing, unless permanently installed, must be properly discarded or dedicated to the well for resampling by hanging the tubing inside the well.
10. Measure and record well depth.
11. Close and lock the well.
12. Samples are capped, labeled and placed in laboratory coolers with ice packs or bagged ice.
13. All equipment is cleaned with successive rinses of pesticide-grade methanol and distilled water.
 - a. Dedicated line is disposed of or left at well site.
14. Equipment/wash blanks are collected when non-dedicated sampling equipment is used.
15. Chain-of-custody forms are completed in triplicate.
 - a. The original and one carbon copy are put into a zip-lock bag and placed into the cooler. The original will be returned following sample analysis.
 - b. A second carbon copy is kept on file.
16. Cooler is sealed with strapping tape and chain-of-custody seals to assure integrity and to prevent tampering of sample.

TABLE 7-1 – CONTRACT-REQUIRED QUANTITATION LEVELS AND ANALYTICAL METHODS FOR ASP INORGANICS, ASP VOLATILES, ASP SEMI-VOLATILES, ASP PESTICIDES, AND PCBS

Target Compound List (TCL) and Contract-Required Quantitation Limit

SECTION 1 - ASP INORGANICS Method: NYSDEC-ASP-91-4			
PARAMETER	METHOD DETECTION LIMIT * (µg/l)	PARAMETER	METHOD DETECTION LIMIT * (µg/l)
1. Aluminum	18.8	13. Magnesium	73.7
2. Antimony	0.399	14. Manganese	2.88
3. Arsenic	0.734	15. Mercury	0.115
4. Barium	1.16	16. Nickel	2.36
5. Beryllium	0.245	17. Potassium	86.7
6. Cadmium	0.808	18. Selenium	5.35
7. Calcium	98.8	19. Silver	0.591
8. Chromium	2.3	20. Sodium	128
9. Cobalt	1.6	21. Thallium	0.157
10. Copper	1.99	22. Vanadium	1.11
11. Iron	51.1	23. Zinc	11.1
12. Lead	0.552	24. Cyanide	0.004

SECTION 2 – ASP ORGANICS (VOLATILES) Method: NYSDEC-ASP-91-1			
VOLATILE	METHOD DETECTION LIMIT * (µg/l)	VOLATILE	METHOD DETECTION LIMIT * (µg/l)
1. Chloromethane	0.143	18. 1,2-Dichloropropane	0.455
2. Bromomethane	1	19. cis-1,3-Dichloropropene	0.455
3. Vinyl Chloride	0.171	20. Trichloroethene	0.314
4. Chloroethane	0.320	21. Dibromochloromethane	0.281
5. Methylene Chloride	0.315	22. 1,1,2-Trichloroethane	0.433
6. Acetone	4.98	23. Benzene	0.428
7. Carbon Disulfide	0.155	24. Trans-1.3-Dichloropropene	0.485
8. 1,1-Dichloroethylene	0.117	25. Bromoform	0.536
9. 1,1-Dichloroethane	0.264	26. 2-Hexanone	2.90
10. 1,2-Dichloroethylene (total)	0.219	27. 4-Methyl, 1,2-Pentanone	2.73
11. Chloroform	0.326	28. Tetrachloroethylene	0.249
12. 1,2-Dichloroethane	0.430	29. Toluene	0.379
13. 2-Butanone	1.85	30. Chlorobenzene	0.377
14. 1,1,1-Trichloroethane	0.238	31. Ethylbenzene	0.298
15. Carbon Tetrachloride	0.208	32. Styrene	0.415
16. Bromodichloromethane	0.343	33. Total Xylenes	0.361
17. 1,1,2,2-Tetrachloroethane	0.367		

SECTION 3 - ASP ORGANICS (SEMI-VOLATILES) Method: NYSDEC-ASP-91-2			
SEMI-VOLATILE	METHOD DETECTION LIMIT * (µg/l)	SEMI-VOLATILE	METHOD DETECTION LIMIT * (µg/l)
1. Phenol	0.292	33. Acenaphthene	1.08
2. Bis(2-chloroethyl)ether	0.295	34. 2,4-Dinitrophenol	14.4
3. 2-Chlorophenol	0.377	35. 4-Nitrophenol	0.689
4. 1,3-Dichlorobenzene	0.13	36. Dibenzofuran	1.10
5. 1,4-Dichlorobenzene	0.13	37. Dinitrotoluene	20
6. 1,2-Dichlorobenzene	0.12	38. Diethylphthalate	0.976
7. 2-Methylphenol	0.259	39. 4-Chlorophenyl phenyl ether	1.28
8. 2,2'oxybis(1- Chloropropane)	0.629	40. Fluorene	0.912
9. 4-Methylphenol	0.235	41. 4-Nitroanile	.0543
10. N-Nitroso-dipropylamine	0.430	42. 4,6-Dinitro-2- methylphenol	13.3
11. Hexachloroethane	1.19	43. N-nitrosodiphenyl amine	0.891
12. Nitrobenzene	0.567	44. 4-Bromophenyl phenyl ether	0.745
13. Isophorone	0.798	45. Hexachlorobenzene	0.396
14. 2-Nitrophenol	0.747	46. Pentachlorophenol	1.45
15. 2,4-Dimethylphenol	0.238	47. Phenanthrene	0.580
16. Bis(2-Chloroethoxy) methane	0.239	48. Anthracene	0.634
17. 2,4-Dichlorophenol	0.421	49. Carbazole	0.679
18. 1,2,4-Trichlorobenzene	0.11	50. Di-n-butyl phthalate	0.840
19. Naphthalene	1.13	51. Fluoranthene	0.842
20. 4-Chloroaniline	1.88	52. Pyrene	1.64
21. Hexachlorobutadiene	0.780	53. Butyl benzyl phthalate	0.854
22. 4-Chloro-3-methylphenol	0.575	54. 3,3'-Dichloro benzidine	1.43
23. 2-Methylnaphthalene	1.10	55. Benzo(a)anthracene	0.592
24. Hexachlorocyclopentadiene	1.72	56. Chrysene	0.907
25. 2,4,6-Trichlorophenol	0.299	57. Bis(2-ethylhexyl) phthalate	1.70
26. 2,4,5-Trichlorophenol	0.279	58. Di-n-octyl phthalate	4.75
27. 2-Chloronaphthalene	1.18	59. Benzo(b)fluoranthene	1.14
28. 2-Nitroaniline	0.474	60. Benzo(k)fluoranthene	0.674
29. Dimethyl phthalate	0.976	61. Benzo(a)pyrene	0.405
30. Acenaphthylene	0.823	62. Indeno(1,2,3-cd) pyrene	1.29
31. 2,6-Dinitrotoluene	0.390	63. Dibenz(a,h) anthracene	0.720
32. 3-Nitroaniline	0.962	64. Benzo(g,h,i)perylene	1.43

SECTION 3 - ASP ORGANICS (PESTICIDES/PCBS) Method: NYSDEC-ASP-91-3			
PESTICIDE/PCB	METHOD DETECTION LIMIT * (µg/l)	PESTICIDE/PCB	METHOD DETECTION LIMIT * (µg/l)
1. Alpha-BHC	0.007	15. 4,4'-DDT	0.004
2. Beta-BHC	0.004	16. Methoxychlor	0.004
3. Delta-BHC	0.005	17. Endrin ketone	0.008
4. Gamma-BHC (lindane)	0.012	18. Endrin aldehyde	0.008
5. Heptachlor	0.003	19. Alpha-Chlordane	0.055
6. Aldrin	0.003	20. Gamma-Chlordane	0.055
7. Heptachlor epoxide	0.005	21. Toxaphene	0.11
8. Endosulfan I	0.002	22. AROCHLOR-1016	0.119
9. Dieldrin	0.003	23. AROCHLOR-1221	0.119
10. 4,4'-DDE	0.002	24. AROCHLOR-1232	0.119
11. Endrin	0.004	25. AROCHLOR-1242	0.119
12. Endosulfan II	0.004	26. AROCHLOR-1248	0.119
13. 4,4'-DDD	0.006	27. AROCHLOR-1254	0.107
14. Endosulfan sulfate	0.006	28. AROCHLOR-1260	0.107

*Matrix: groundwater. For soil matrix, multiply CRDL by 100.

**Quantitation limit for medium-level soil is 1,200 µg/kg (wet weight basis).

APPENDIX D
COMMUNITY AIR MONITORING PLAN

Community Air Monitoring Plan

1510 Broadway LLC

Site #C224280

1510 Broadway Dry Cleaner Site

Brooklyn, New York

1.0 INTRODUCTION

This document presents a Community Air Monitoring Plan (CAMP) for the remedial investigation (RI) and interim remedial measures (IRMs) for the proposed development at 1510 Broadway, Brooklyn, New York (the "Site").

The Site, which is the subject of this RIWP, is approximately 0.46-acres. The Site property is identified on the city tax map as Block 1489, Lot 11 and is located at 1510 Broadway in the Bedford-Stuyvesant / Brownsville section of Brooklyn, New York. The Site is located in an area of primarily mixed commercial and residential uses. The Site and nearby properties are generally level. The Site previously consisted of nine (9) lots (6, 11, 12, 13, 14, 15, 16, 17, 18) and was historically identified as 7 Saratoga Avenue and 1510-1524 Broadway. The Site has been historically utilized for industrial and commercial purposes, and most notably former dry-cleaning operations and printing operations.

The Site is bounded to the north by Jefferson Avenue beyond which lies transit system sub-station; to the south by an apparent vacant building and Hancock Street, beyond which lies a medical center and residential properties; to the east by Broadway and an elevated subway (J and Z line) tracks, beyond which lies commercial properties; and to the west by the Saratoga Avenue, beyond which lies residential properties.

The proposed development consists of one eight-story structure with a partial cellar level. The cellar will contain mechanical spaces and building storage. The first floor will contain the commercial retail space, a residential lobby, five residential units, a residential recreational area, laundry and bike rooms, and additional mechanical and

building storage rooms. Residential units will occupy the second through eighth floors, with an exterior residential recreation courtyard proposed on the second floor.

1.1 OBJECTIVES

The objective of this CAMP is to provide a measure of protection for the downwind community from potential airborne contaminant releases that may arise as a result of the planned remedial excavation and construction, which may include temporary soil stockpiling.

1.2 METHODS

The CAMP will include continuous monitoring for particulate matter (e.g., airborne “dust”) and volatile organic compounds (VOCs) during the planned remedial excavation and construction activities. Readings will be recorded and will be available for State (DEC and DOH) personnel to review, as requested.

1.3 PERIODIC MONITORING

Periodic monitoring for VOCs will be conducted 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 might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required 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.

1.4 VOC MONITORING, RESPONSE LEVELS, AND ACTIONS

VOC Monitoring, Response Levels, and Actions Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment

appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should 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 must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can 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 must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can 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 must be shutdown.

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

1.5 PARTICULATE MONITORING, RESPONSE LEVELS, AND ACTIONS

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should 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 must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should 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 must be employed. Work may 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 must be stopped and a re-evaluation of activities initiated. Work can 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.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

1.5 SPECIAL REQUIREMENTS FOR WORK WITHIN 20 FEET OF POTENTIALLY EXPOSED INDIVIDUAL STRUCTURES

When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must 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 should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

- If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring should 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 should also be pre-determined). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should 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 should 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 should be pre-determined, as necessary, for each site.

APPENDIX E

NYSDEC SOIL CLEANUP OBJECTIVES

375-6.8

Soil cleanup objective tables.

(a) Unrestricted use soil cleanup objectives.

Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Unrestricted Use
Metals		
Arsenic	7440-38-2	13 ^c
Barium	7440-39-3	350 ^c
Beryllium	7440-41-7	7.2
Cadmium	7440-43-9	2.5 ^c
Chromium, hexavalent ^e	18540-29-9	1 ^b
Chromium, trivalent ^e	16065-83-1	30 ^c
Copper	7440-50-8	50
Total Cyanide ^{e, f}		27
Lead	7439-92-1	63 ^c
Manganese	7439-96-5	1600 ^c
Total Mercury		0.18 ^c
Nickel	7440-02-0	30
Selenium	7782-49-2	3.9 ^c
Silver	7440-22-4	2
Zinc	7440-66-6	109 ^c
PCBs/Pesticides		
2,4,5-TP Acid (Silvex) ^f	93-72-1	3.8
4,4'-DDE	72-55-9	0.0033 ^b
4,4'-DDT	50-29-3	0.0033 ^b
4,4'-DDD	72-54-8	0.0033 ^b
Aldrin	309-00-2	0.005 ^c
alpha-BHC	319-84-6	0.02
beta-BHC	319-85-7	0.036
Chlordane (alpha)	5103-71-9	0.094

Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Unrestricted Use
delta-BHC ^g	319-86-8	0.04
Dibenzofuran ^f	132-64-9	7
Dieldrin	60-57-1	0.005 ^c
Endosulfan I ^{d, f}	959-98-8	2.4
Endosulfan II ^{d, f}	33213-65-9	2.4
Endosulfan sulfate ^{d, f}	1031-07-8	2.4
Endrin	72-20-8	0.014
Heptachlor	76-44-8	0.042
Lindane	58-89-9	0.1
Polychlorinated biphenyls	1336-36-3	0.1
Semivolatile organic compounds		
Acenaphthene	83-32-9	20
Acenaphthylene ^f	208-96-8	100 ^a
Anthracene ^f	120-12-7	100 ^a
Benz(a)anthracene ^f	56-55-3	1 ^c
Benzo(a)pyrene	50-32-8	1 ^c
Benzo(b)fluoranthene ^f	205-99-2	1 ^c
Benzo(g,h,i)perylene ^f	191-24-2	100
Benzo(k)fluoranthene ^f	207-08-9	0.8 ^c
Chrysene ^f	218-01-9	1 ^c
Dibenz(a,h)anthracene ^f	53-70-3	0.33 ^b
Fluoranthene ^f	206-44-0	100 ^a
Fluorene	86-73-7	30
Indeno(1,2,3-cd)pyrene ^f	193-39-5	0.5 ^c
m-Cresol ^f	108-39-4	0.33 ^b
Naphthalene ^f	91-20-3	12
o-Cresol ^f	95-48-7	0.33 ^b

Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Unrestricted Use
p-Cresol ^f	106-44-5	0.33 ^b
Pentachlorophenol	87-86-5	0.8 ^b
Phenanthrene ^f	85-01-8	100
Phenol	108-95-2	0.33 ^b
Pyrene ^f	129-00-0	100
Volatile organic compounds		
1,1,1-Trichloroethane ^f	71-55-6	0.68
1,1-Dichloroethane ^f	75-34-3	0.27
1,1-Dichloroethene ^f	75-35-4	0.33
1,2-Dichlorobenzene ^f	95-50-1	1.1
1,2-Dichloroethane	107-06-2	0.02 ^c
cis -1,2-Dichloroethene ^f	156-59-2	0.25
trans-1,2-Dichloroethene ^f	156-60-5	0.19
1,3-Dichlorobenzene ^f	541-73-1	2.4
1,4-Dichlorobenzene	106-46-7	1.8
1,4-Dioxane	123-91-1	0.1 ^b
Acetone	67-64-1	0.05
Benzene	71-43-2	0.06
n-Butylbenzene ^f	104-51-8	12
Carbon tetrachloride ^f	56-23-5	0.76
Chlorobenzene	108-90-7	1.1
Chloroform	67-66-3	0.37
Ethylbenzene ^f	100-41-4	1
Hexachlorobenzene ^f	118-74-1	0.33 ^b
Methyl ethyl ketone	78-93-3	0.12
Methyl tert-butyl ether ^f	1634-04-4	0.93
Methylene chloride	75-09-2	0.05

Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Unrestricted Use
n - Propylbenzene ^f	103-65-1	3.9
sec-Butylbenzene ^f	135-98-8	11
tert-Butylbenzene ^f	98-06-6	5.9
Tetrachloroethene	127-18-4	1.3
Toluene	108-88-3	0.7
Trichloroethene	79-01-6	0.47
1,2,4-Trimethylbenzene ^f	95-63-6	3.6
1,3,5-Trimethylbenzene ^f	108-67-8	8.4
Vinyl chloride ^f	75-01-4	0.02
Xylene (mixed)	1330-20-7	0.26

All soil cleanup objectives (SCOs) are in parts per million (ppm).

Footnotes

^a The SCOs for unrestricted use were capped at a maximum value of 100 ppm. See [Technical Support Document \(TSD\)](#), section 9.3.

^b For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the Track 1 SCO value.

^c For constituents where the calculated SCO was lower than the rural soil background concentration, as determined by the Department and Department of Health rural soil survey, the rural soil background concentration is used as the Track 1 SCO value for this use of the site.

^d SCO is the sum of endosulfan I, endosulfan II and endosulfan sulfate.

^e The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.

^f Protection of ecological resources SCOs were not developed for contaminants identified in Table 375-6.8(b) with “NS”. Where such contaminants appear in Table 375-6.8(a), the applicant may be required by the Department to calculate a protection of ecological resources SCO according to the TSD.

(b) Restricted use soil cleanup objectives.

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
Metals							
Arsenic	7440-38-2	16 ^f	16 ^f	16 ^f	16 ^f	13 ^f	16 ^f
Barium	7440-39-3	350 ^f	400	400	10,000 ^d	433	820
Beryllium	7440-41-7	14	72	590	2,700	10	47
Cadmium	7440-43-9	2.5 ^f	4.3	9.3	60	4	7.5
Chromium, hexavalent ^h	18540-29-9	22	110	400	800	1 ^e	19
Chromium, trivalent ^h	16065-83-1	36	180	1,500	6,800	41	NS
Copper	7440-50-8	270	270	270	10,000 ^d	50	1,720
Total Cyanide ^h		27	27	27	10,000 ^d	NS	40
Lead	7439-92-1	400	400	1,000	3,900	63 ^f	450
Manganese	7439-96-5	2,000 ^f	2,000 ^f	10,000 ^d	10,000 ^d	1600 ^f	2,000 ^f
Total Mercury		0.81 ^j	0.81 ^j	2.8 ^j	5.7 ^j	0.18 ^f	0.73
Nickel	7440-02-0	140	310	310	10,000 ^d	30	130
Selenium	7782-49-2	36	180	1,500	6,800	3.9 ^f	4 ^f
Silver	7440-22-4	36	180	1,500	6,800	2	8.3
Zinc	7440-66-6	2200	10,000 ^d	10,000 ^d	10,000 ^d	109 ^f	2,480
PCBs/Pesticides							
2,4,5-TP Acid (Silvex)	93-72-1	58	100 ^a	500 ^b	1,000 ^c	NS	3.8
4,4'-DDE	72-55-9	1.8	8.9	62	120	0.0033 ^e	17
4,4'-DDT	50-29-3	1.7	7.9	47	94	0.0033 ^e	136
4,4'-DDD	72-54-8	2.6	13	92	180	0.0033 ^e	14
Aldrin	309-00-2	0.019	0.097	0.68	1.4	0.14	0.19
alpha-BHC	319-84-6	0.097	0.48	3.4	6.8	0.04 ^g	0.02
beta-BHC	319-85-7	0.072	0.36	3	14	0.6	0.09
Chlordane (alpha)	5103-71-9	0.91	4.2	24	47	1.3	2.9

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
delta-BHC	319-86-8	100 ^a	100 ^a	500 ^b	1,000 ^c	0.04 ^g	0.25
Dibenzofuran	132-64-9	14	59	350	1,000 ^c	NS	210
Dieldrin	60-57-1	0.039	0.2	1.4	2.8	0.006	0.1
Endosulfan I	959-98-8	4.8 ⁱ	24 ⁱ	200 ⁱ	920 ⁱ	NS	102
Endosulfan II	33213-65-9	4.8 ⁱ	24 ⁱ	200 ⁱ	920 ⁱ	NS	102
Endosulfan sulfate	1031-07-8	4.8 ⁱ	24 ⁱ	200 ⁱ	920 ⁱ	NS	1,000 ^c
Endrin	72-20-8	2.2	11	89	410	0.014	0.06
Heptachlor	76-44-8	0.42	2.1	15	29	0.14	0.38
Lindane	58-89-9	0.28	1.3	9.2	23	6	0.1
Polychlorinated biphenyls	1336-36-3	1	1	1	25	1	3.2
Semivolatiles							
Acenaphthene	83-32-9	100 ^a	100 ^a	500 ^b	1,000 ^c	20	98
Acenaphthylene	208-96-8	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	107
Anthracene	120-12-7	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	1,000 ^c
Benz(a)anthracene	56-55-3	1 ^f	1 ^f	5.6	11	NS	1 ^f
Benzo(a)pyrene	50-32-8	1 ^f	1 ^f	1 ^f	1.1	2.6	22
Benzo(b)fluoranthene	205-99-2	1 ^f	1 ^f	5.6	11	NS	1.7
Benzo(g,h,i)perylene	191-24-2	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	1,000 ^c
Benzo(k)fluoranthene	207-08-9	1	3.9	56	110	NS	1.7
Chrysene	218-01-9	1 ^f	3.9	56	110	NS	1 ^f
Dibenz(a,h)anthracene	53-70-3	0.33 ^e	0.33 ^e	0.56	1.1	NS	1,000 ^c
Fluoranthene	206-44-0	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	1,000 ^c
Fluorene	86-73-7	100 ^a	100 ^a	500 ^b	1,000 ^c	30	386
Indeno(1,2,3-cd)pyrene	193-39-5	0.5 ^f	0.5 ^f	5.6	11	NS	8.2
m-Cresol	108-39-4	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	0.33 ^e
Naphthalene	91-20-3	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	12

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
o-Cresol	95-48-7	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	0.33 ^e
p-Cresol	106-44-5	34	100 ^a	500 ^b	1,000 ^c	NS	0.33 ^e
Pentachlorophenol	87-86-5	2.4	6.7	6.7	55	0.8 ^e	0.8 ^e
Phenanthrene	85-01-8	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	1,000 ^c
Phenol	108-95-2	100 ^a	100 ^a	500 ^b	1,000 ^c	30	0.33 ^e
Pyrene	129-00-0	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	1,000 ^c
Volatiles							
1,1,1-Trichloroethane	71-55-6	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	0.68
1,1-Dichloroethane	75-34-3	19	26	240	480	NS	0.27
1,1-Dichloroethene	75-35-4	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	0.33
1,2-Dichlorobenzene	95-50-1	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	1.1
1,2-Dichloroethane	107-06-2	2.3	3.1	30	60	10	0.02 ^f
cis-1,2-Dichloroethene	156-59-2	59	100 ^a	500 ^b	1,000 ^c	NS	0.25
trans-1,2-Dichloroethene	156-60-5	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	0.19
1,3-Dichlorobenzene	541-73-1	17	49	280	560	NS	2.4
1,4-Dichlorobenzene	106-46-7	9.8	13	130	250	20	1.8
1,4-Dioxane	123-91-1	9.8	13	130	250	0.1 ^e	0.1 ^e
Acetone	67-64-1	100 ^a	100 ^b	500 ^b	1,000 ^c	2.2	0.05
Benzene	71-43-2	2.9	4.8	44	89	70	0.06
Butylbenzene	104-51-8	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	12
Carbon tetrachloride	56-23-5	1.4	2.4	22	44	NS	0.76
Chlorobenzene	108-90-7	100 ^a	100 ^a	500 ^b	1,000 ^c	40	1.1
Chloroform	67-66-3	10	49	350	700	12	0.37
Ethylbenzene	100-41-4	30	41	390	780	NS	1
Hexachlorobenzene	118-74-1	0.33 ^e	1.2	6	12	NS	3.2
Methyl ethyl ketone	78-93-3	100 ^a	100 ^a	500 ^b	1,000 ^c	100 ^a	0.12

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
Methyl tert-butyl ether	1634-04-4	62	100 ^a	500 ^b	1,000 ^c	NS	0.93
Methylene chloride	75-09-2	51	100 ^a	500 ^b	1,000 ^c	12	0.05
n-Propylbenzene	103-65-1	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	3.9
sec-Butylbenzene	135-98-8	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	11
tert-Butylbenzene	98-06-6	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	5.9
Tetrachloroethene	127-18-4	5.5	19	150	300	2	1.3
Toluene	108-88-3	100 ^a	100 ^a	500 ^b	1,000 ^c	36	0.7
Trichloroethene	79-01-6	10	21	200	400	2	0.47
1,2,4-Trimethylbenzene	95-63-6	47	52	190	380	NS	3.6
1,3,5- Trimethylbenzene	108-67-8	47	52	190	380	NS	8.4
Vinyl chloride	75-01-4	0.21	0.9	13	27	NS	0.02
Xylene (mixed)	1330-20-7	100 ^a	100 ^a	500 ^b	1,000 ^c	0.26	1.6

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.

^f For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the Department and Department of Health rural soil survey, the rural soil background concentration is used as the Track 2 SCO value for this use of the site.

^g This SCO is derived from data on mixed isomers of BHC.

^h The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.

ⁱ This SCO is for the sum of endosulfan I, endosulfan II, and endosulfan sulfate.

^j This SCO is the lower of the values for mercury (elemental) or mercury (inorganic salts). See TSD Table 5.6-1.