FORMER EXCELSIOR BAG

YONKERS, NEW YORK

Interim Remedial Measure Work Plan

BCP Site Number: C360190
AKRF Project Number: 200131

Prepared for:

New York State Department of Environmental Conservation
Division of Environmental Remediation, Remedial Bureau C
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MARCH 2022

CERTIFICATIONS

I, Rebecca Kinal, certify that I am currently a NYS registered Professional Engineer and that this Interim Remedial Measure (IRM) 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).

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

Rebecca Kinal	March 10, 2022	
NYS Professional Engineer #	Date	Signature
082046-1		

PE Stamp

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

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1.0 INTRODUCTION

This Interim Remedial Measure (IRM) Work Plan (IRMWP) has been prepared by AKRF, Inc. (AKRF) on behalf of Extell Hudson Waterfront, LLC (the Volunteer) for the Former Excelsior Bag site located at 25, 35 and 45 Riverside Drive (f/k/a 159-161 Alexander Street and 15 Babcock Place), in Yonkers, New York (the Site). The Site is designated for redevelopment with two mixed-use residential buildings and a portion of a third mixed-use residential building. The Site location is shown on Figure 1, and a Site Plan is provided as Figure 2.

The purpose of this IRMWP is to facilitate limited remediation at the Site [i.e., removal of the suspected underground storage tanks (USTs) and a semi-volatile organic compound (SVOC) source area located in the southeast portion of the Site] prior to the preparation and New York State Department of Environmental Conservation (NYSDEC) approval of a Remedial Action Work Plan (RAWP). This IRMWP is based upon the findings presented in previous investigations described below (discussed in more detail in Section 3.0), and will be implemented in accordance with the Site-Specific Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) provided in Appendix A.

2.0 SITE DESCRIPTION AND HISTORY

2.1 Site Description and Surrounding Land Use

The Site is located at 25, 35 and 45 Riverside Drive (f/k/a 159-161 Alexander Street and 15 Babcock Place), and surrounding streets in Yonkers, New York, hereafter referred to as the "Site." The Site is part of a larger Extell Hudson Waterfront redevelopment plan approved by the City of Yonkers Planning Board on April 11, 2018, for which the final subdivision map was filed with the Westchester County Clerk's office on January 24, 2020. The Site is now identified by the City of Yonkers Tax Map as Section 2, Block 2620, Lot 2, portion of Lot 9, Lots 10, 11 and 12, Fisherman Way, Colman Way, and portion of Riverside Drive. The Site consists of an approximately 243,952-square foot vacant property with concrete/asphalt paved surfaces, a landscaped area (to the north), and revetment stone (along the western boundary adjacent to the Hudson River).

The Site is bound to the north by vacant land that was remediated pursuant to the Brownfield Cleanup Program (BCP) and at which construction of Buildings D and C of the Extell Hudson Waterfront development is underway (the Former BICC Cables BCP Site No. C360051); to the east by Riverside Drive (f/k/a Alexander Street), followed by a Metropolitan Transit Authority bus depot; to the southeast by the Greyston Bakery at 104 Alexander Street [Woodworth Avenue Works Former Manufactured Gas Plant (MGP) Site, NYSDEC Administrative Order on Consent AOC Index No. CO0-20180516- 519, Site No. 360164]; to the south by the Avalon Yonkers multi-family residential development [a/k/a Polychrome Research and Development (R&D) BCP Site No. C360099]; and to the west by the Hudson River. The larger surrounding area is occupied by mixed residential, commercial, and industrial uses. A Site Location Map is provided as Figure 1, and a Site Plan is provided as Figure 2.

The Volunteer was accepted into the NYSDEC BCP as a Volunteer (BCP Site No. C360190), and a NYSDEC Brownfield Cleanup Agreement (BCA) (BCA Index No. C360190-04-20) was executed on April 30, 2020. A Remedial Investigation Work Plan (RIWP) was prepared by AKRF in July 2020 and approved by NYSDEC on August 4, 2020, and subsequent investigation activities were conducted in September 2020 and April 2021. A draft Remedial Investigation Report (RIR) was submitted to NYSDEC on July 9, 2021, and preliminary comments on the draft July 2021 RIR were provided by NYSDEC to AKRF (on behalf of the Volunteer) via email on July 29, 2021. A formal RIR comment letter was issued by NYSDEC on September 7, 2021. Based upon NYSDEC comments, a Supplemental Remedial Investigation (SRI) was conducted in August 2021. The final RIR, which incorporated the results of the September 2020/April 2021 Remedial Investigation (RI) and the August 2021 SRI field activities, was submitted to NYSDEC on October 8, 2021 and approved by NYSDEC (with modifications) on October 29, 2021. The final RIR was submitted to NYSDEC on November 2, 2021.

Following completion of the RIR, a Supplementary Investigation #1 (SI #1) was conducted on December 6, 2021 (in accordance with the NYSDEC-approved December 2021 SI Work Plan #1) to further evaluate potential areas of concern (PAOCs) for metals identified during the 2020-2021 RI, and to establish any metals source areas, if present, that would be remediated as part of this IRMWP (none of which were identified). The results of the SI #1 were summarized in the January 2022 SI Report #1 (SIR #1) (also summarized in Section 3.0).

A Supplementary Investigation Work Plan #2 (SIWP #2) to refine the horizontal and vertical extent of dense non-aqueous phase liquids (DNAPL) (i.e., coal tar) documented above the Hudson River sediment confining layer during the 2020-2021 RI was submitted to NYSDEC on December 15, 2021. The SIWP #2 was revised (based upon comments provided by NYSDEC on January 25, 2022) and resubmitted to NYSDEC on February 1, 2022. NYSDEC approved the

SIWP #2 on February 4, 2022. The SI #2 field activities are ongoing as of the date of this IRMWP; however, remedial activities associated with the documented on-Site DNAPL (i.e., coal tar) contamination is outside the scope of work of this IRMWP and will be addressed under the forthcoming RAWP.

2.2 Proposed Redevelopment Plan

The Site is part of the Extell Hudson Waterfront development project, which encompasses the Site, and the Former BICC Cables Site (BCP Site No. C360051), where remediation has been completed with a Certificate of Completion issued in August 2017. Proposed development of the Site includes two low-rise residential buildings (referred to as Building E and Building F), a portion of a third low-rise residential building (Building D), surrounding access roadways, shoreline stabilization, and a waterfront esplanade. The first phase of construction (Phase I Construction), which includes components on both the Site and the north adjacent Former BICC Cables site [NYSDEC BCP Site No. C360051], began on September 13, 2021. Phase I Construction at the Site, which is being conducted in conformance with Supplemental Environmental Management Documentation submitted to NYSDEC on June 23, 2021, includes construction of a portion of Building D, surrounding access roadways, and the esplanade.

All of the buildings constructed at the Site will be seven stories that consist of five stories over a two-story podium. The buildings will have podium level open space courtyards with resident amenities, including an indoor pool, pool deck, shade structures, and landscaping. Building E is planned to include 243 residential units and a gross square footage of 309,634, with 6,239 square feet dedicated to retail. Building F is planned to include 142 residential units and a gross square footage of 211,703, with 10,946 square feet dedicated to retail. The Site will also house a portion of Building D, with the remainder located on the Former BICC Cable site. Building D will also be a low rise building with similar design to Buildings E and F. Building D will include 176 units and a gross square footage of 196,214. Approximately 10% of the units in Buildings D, E and F will be dedicated to affordable housing.

Based upon discussion with NYSDEC, it is anticipated that the Site will be remediated to achieve site-specific Track 4 soil cleanup objectives (SCOs), which will be detailed in the future RAWP.

2.3 Site Geology, Hydrogeology and Subsurface Characteristics

The following geologic and hydrogeological conditions were noted during the 2020-2021 RI and August 2021 SRI:

1. Site stratigraphy consists of an uppermost layer of historic fill materials, encountered at depths up to 20 feet bgs, that is generally underlain by a native Hudson River sediment (intermediate) confining layer, starting at depths between 13.5 and 35 feet bgs and extending to depths up to 116 feet bgs. A layer of native Hudson River sands was encountered in some borings between historic fill materials and the native Hudson River sediment (intermediate) confining layer at depths ranging from 7 to 35 feet bgs. Beneath the Hudson River sediment confining layer is a sand and clayey silt layer of varying thickness (observed between 25 to 50 feet thick across the Site) followed by the glacial till (deep) confining layer encountered at depths ranging from 103 feet to 145 feet bgs.
2. As detailed in the "Surficial Geological Map of New York: Lower Hudson Sheet", dated 1989, the Site's historical fill materials are underlain by lacustrine sand, which consists of sand deposits associated with large bodies of water, generally a near-shore deposit or near a sand source, well sorted, stratified, generally quartz sand, with variable thickness. According to the "Geologic Map of New York: Lower Hudson Sheet", dated March 1970, bedrock at the Site is expected to consist of garnet-bearing gneiss and interlayered quartzite containing varying amounts of biotite, garnet, sillimanite; with minor marble,

amphibolite, and rusty paragneiss. While previous Environmental Site Assessments (ESAs) and the RI/SRI conducted at the Site did not include drilling activities that extended to bedrock, several soil borings were advanced during the SRI to equipment refusal (on suspected boulders) within a deep glacial till layer confining layer, which is suspected to be a thin geologic layer overlaying bedrock. The top of the glacial till layer slopes downward to the west (toward the Hudson River) across the Site at depths ranging from 103 feet bgs (SRI-SB-05) to 145 feet bgs (SRI-SB-06), which is anticipated to be generally consistent with the depths and slope of the underlying bedrock at the Site.

3. Based on Site-specific groundwater measurements, the depth to groundwater beneath the Site ranges from approximately 4 to 6 feet bgs and is expected to flow beneath the Site in a westerly direction.

2.4 Nearby Areas of Public Concern

The areas immediately surrounding the Site to the south and east are predominantly residential and commercial in nature. The area to the north was remediated pursuant to the BCP and redevelopment is underway. The nearest sensitive receptors (i.e., schools, daycares, or hospitals) include Charter School of Educational Excellence located at 260 Warburton Ave, Yonkers, NY 10701, approximately 1,050 feet northeast of the Site; and Beczak Environmental Education Center, located at 35 Alexander Street. Yonkers NY 10701, approximately 1,110 feet south of the Site.

On-Site Receptors: Since the Site is partially vacant and partially under construction, existing on-site potential receptors include Site visitors, trespassers, construction workers, and inspectors. Once the Site is redeveloped, the on-site potential receptors will include adult and child residents, employees, and visitors (e.g., pedestrians, cyclists, customers, vendors, and inspectors).

Off-Site Receptors: Potential off-site receptors within a 0.25-mile radius of the Site include adult and child residents, commercial and construction workers, students, pedestrians, and cyclists, based on the following existing and future surrounding uses:

1. Commercial Businesses;
2. Residential Buildings;
3. Building Construction/Renovation;
4. Roadways, bike paths; and
5. Schools/Day Care Facilities

2.5 Site History

The Site history described below is based on historical sources (i.e., fire insurance maps, aerial photography, and city directories), provided in the February 2017 Phase I ESA prepared by Langan Engineering, Environmental, Surveying, and Landscape Architecture, D.P.C. (Langan).

As of 1898, a majority of the Site footprint was identified as land under water within the Hudson River with the exception of a vacant upland area present in the southeast corner.

By 1917, the southeast corner of the Site was developed with several structures identified as Yerks & Co. Lumber and Coal. Yonkers Hay and Grain Co. also occupied one on-site structure. Fill was apparently placed to raise the eastern portion of the Site above the Hudson River elevation with the western portion remaining as land under water. The reclaimed land was occupied by York Central Freight Yard railroad tracks.

By 1942, the Site was improved with several centrally located buildings identified as the New York Engineering Company (NYEC). One additional building east of the NYEC was identified as Otto Brehm Wholesale Flour. Two docks were built along the southwestern boundary of the Site over the Hudson River. The southeast lumber yard of the Site was now identified as J.A. Mahlstedt Lumber Company.

By 1951, the NYEC building footprint was extended to the north. A blacksmith also occupied this area. It appeared that additional land to the west was raised above the Hudson River elevation, and the docks in the southwest corner were no longer present. The southern portion of the Site was occupied by Arthur G. Blair Inc. Boat Building with a building in the southeast corner identified as a machine shop. Three additional structures were built in this area, one of which was identified to contain castor oil products. Between 1951 and 1957, a few smaller on-site structures were razed.

By 1971, several additional smaller structures were razed, and a machine shop was identified in the northern portion of the Site. The existing building in the southeast corner was no longer identified as a machine shop. It appeared that the remaining underwater western portion of the Site had been raised above the Hudson River elevation. By 1978, the NYEC and Wholesale Flour buildings were razed and a building, utilized for manufacturing, was present in the southern portion of the Site.

By 1990, an additional building utilized for manufacturing was present in the northeastern portion of the Site. Between 1991 and 2004, the freight yard and railroad tracks on the northern portion of the Site were no longer present. Additional warehouse space, utilized for manufacturing, was constructed in the central portion of the Site sometime after 2004 (creating one contiguous approximately 97,000 square-foot, one- to two-story industrial structure). Between 1992 and approximately 2014, the on-site structures were used for industrial manufacturing by Excelsior Transparent Bag Manufacturing Corporation. From 2014 to 2020, the structures were used intermittently as a film studio.

All existing above grade structures at the Site were demolished in February through March 2021 in order to conduct the RI.

The Site is currently owned by the Volunteer.

3.0 PREVIOUS INVESTIGATIONS

Previous environmental reports for the Site are summarized below:

Phase I Environmental Site Assessment – 159-161 Alexander Street & 15 Babcock Place, City of Yonkers, New York, Langan Engineering, Environmental, Surveying, and Landscape Architecture, D.P.C., September 2017

Langan prepared a Phase I ESA for the Site (referred to in the report as the "Subject Property") in September 2017. The September 2017 Phase I ESA was prepared as an update to information presented in a February 2017 Phase I ESA also prepared by Langan. The Phase I ESA was performed in conformance with ASTM Standard E1527-13 and assessed the potential for the presence of hazardous materials, based on reconnaissance of the Site and surrounding area, review of data on geology and hydrology of the surrounding area, examination of historical Sanborn Fire Insurance maps and aerial photographs, and review of pertinent federal and state regulatory databases. The Phase I ESA identified the following recognized environmental conditions (RECs):

- REC 1 – Historical Use of Subject Property - Former uses of potential concern for the Site included a boat manufacturing yard, a machine shop, steel fabrication plant, and flexographic manufacturing and printing. Prior to 2012, the Site was operated by the Excelsior Transparent Bag Manufacturing Corporation for manufacturing and printing of bags since at least 1992. Evidence of former manufacturing equipment (ink mixing machine, ink storage vats, polyethylene bead aboveground storage tanks, former parts cleaning area, etc.) was observed on the Site during the Phase I ESA Site inspection. Additionally, numerous floor drains were noted throughout the interior of the Subject Property. The report noted that without building plans (which were not provided) to identify where these drains discharged, it could not be determined how these areas may be adversely affected the environment and the discharge fate of the floor drains was identified as a site-specific limitation. ESA.

  In March 2017, EBI Consulting (EBI) performed a limited Phase II ESA at the Subject Property to evaluate potential subsurface impacts from the RECs identified in Langan's February 2017 Phase I ESA. As described in detail below (see REC 2 & 3), limited petroleum-related groundwater impacts and Site-wide soil vapor impacts were identified that were attributed to the historical use of the Site. With the exception these impacts, analytes detected in soil and groundwater were attributed to the presence of historical fill characteristic of an urban environment (i.e., EBI's findings did not suggest evidence indicative of a widespread release of petroleum or hazardous materials in soil or groundwater at the Site). However, EBI's investigation was limited in scope; therefore, the potential for unidentified subsurface impacts associated with historical use remains.

- REC 2 – Petroleum-Impacted Groundwater on the Southeast Portion of the Site - Based on information obtained during EBI's March 2017 Phase II ESA, concentrations of petroleum-related volatile organic compounds (VOCs) (benzene, ethylbenzene, isopropylbenzene, and xylenes) were detected above NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) Ambient Water Quality Standards and Guidance Values (AWQSGV) Class GA groundwater standards in one monitoring well located in the southeast portion of the Site. Given the monitoring well's up-gradient location on the Site, the identified contamination may have been attributable to an off-site source.

- REC 3 – Soil Vapor Impacts beneath the Site - As part of EBI's March 2017 Phase II ESA, four soil vapor samples were collected from the area beneath the existing buildings. Elevated concentrations of VOCs, in particular tetrachloroethene (PCE) and trichloroethene (TCE), were detected in soil vapor samples collected below the building footprint. According to EBI,

the source of the PCE was not identified. The identified impacts in soil vapor beneath the Site were determined by Langan to represent a REC.

- REC 4 – Historical On-Site Petroleum Bulk Storage - According to information provided in the Environmental Data Resources, Inc. (EDR) Report reviewed as part of this ESA, a former 2,000-gallon fuel oil UST was installed at the Site in December 1981 and removed in August 1997. According to a Phase I ESA prepared in April 2000 (HRP Associates, Inc.), the UST was historically used to heat the building on the north end of the Site. No documentation of the condition of the UST system or soil conditions in the area of the UST subsequent to removal was obtained as part of the Phase I ESA. Although the findings of EBI's March 2017 Phase II ESA did not suggest evidence indicative of a widespread release of petroleum in soil or groundwater, EBI's investigation did not include a geophysical survey to potential locate the historical UST and the sampling was not focused on the suspected former UST location (on the north end of the Site). Based on the presence of a historic UST and lack of any documentation of UST closure or associated sampling in the UST area, the historical UST was considered a REC.

The following Historical Recognized Environmental Condition (HREC) were identified:

- HREC 1 – Historical On-Site Bulk Storage Tanks (Closed Spill No. 9406513) - Evidence of two 2,900-gallon USTs formerly containing alcohol-based solvents were noted during the Phase I ESA. The USTs were located along the southeastern exterior wall of the on-site building. According to information provided in the EDR Report reviewed as part of this ESA, a tank test failure was reported to the NYSDEC in August 1994 and spill case no. 9406513 was assigned. According to the spill case narrative, the UST (only one UST was discussed in the spill case narrative) was pumped out and soil excavation was performed to remove impacted material from around the UST. The spill case was closed by NYSDEC in April 2010. Details with respect to the date of soil excavation, soil quantities removed, and samples collected (if any) were not provided. However, based on the information provided, the spill case was addressed to the satisfaction of NYSDEC, and therefore, Langan concluded that it represented an HREC.
- HREC 2 – Closed Spill No. 0408137 - A closed spill listing for spill no. 0408137 was identified for an unknown quantity of n-propanol and n-propylacetate spilled to soil in October 2004. According to the spill case narrative, the spill was cleaned up in December 2004, and the spill case was closed by the Westchester County Department of Health. No further details regarding the spill were obtained during this ESA. As the spill was closed by the appropriate regulatory agency (Westchester County Department of Health), Langan concluded that spill case 0408137 represented an HREC.

The following Business Environmental Risks (BERs):

- BER 1 – Historic Fill Material - Much of the land around and adjacent to the Site was created by filling in the Hudson River using imported fill material of unknown origin. This landfilling was conducted in stages, began in the late 1880s, and was completed in the mid-1970s. The presence of impacted fill material beneath the Site was confirmed following completion of EBI's March 2017 Phase II ESA, wherein soil analytical results identified widespread SVOC and metals, in soil to depths of 8 feet bgs. Langan did not consider the presence of fill material at the Site to be a REC, as defined by ASTM 1527-13, as the presence of this material along long stretches along the Hudson River waterfront was a well-known condition not generally the subject of regulatory enforcement actions. Langan also stated that the fill material posed minimal risk to human health and the environment because the Site was covered with buildings and hardscape, and therefore, could be considered a de minimis condition. In light of the User's plans to redevelop the Subject Property, the fill was

considered a BER, and implementation of soil handling and management procedures during site construction activities to address proper excavation, re-use, handling, and possible off-site disposal of this material was recommended.

- BER 2 – Regional Groundwater Quality – Langan identified impacts from historical operations conducted at adjacent or nearby properties was identified as a BER due to the potential for migration of contaminants to impact soil vapor and/or groundwater at the Site. Since potable water is provided to the Site by the City of Yonkers and is derived from surface impoundments in the Croton, Catskill, and Delaware watersheds, Langan concluded that the potential contaminated groundwater posed minimal risk to human health considering groundwater was not used for any purpose at the Site. However, Langan noted that the presence and migration of contaminants may impact future Site redevelopment activities such as dewatering, as laboratory analytical results documenting discharge water quality were required for municipal discharge permits.

Phase II ESA – 159-161 Alexander Street, Yonkers, NY, EBI Consulting, April 2017

According to the EBI Phase II ESA, a limited subsurface investigation was performed at the Subject Property on March 17, 2017, to evaluate the potential impact to the Site from the RECs identified in the February 2017 Phase I ESA prepared by Langan.

EBI's investigation consisted of the following:

- Advancing 13 borings by direct push Geoprobe to depths ranging from 2.5 to 12 feet bgs.
- Collection of continuous soil samples every 4 feet, field screening the vapor headspace of the soil samples for total ionizable VOCs using a photoionization detector (PID), and a description of the physical characteristics of the soil samples on boring logs.
- Collection, laboratory analysis, and reporting of one to three soil samples per boring (depending on recovery and/or groundwater presence for analysis of VOCs, SVOCs, metals, and polychlorinated biphenyls (PCBs). A total of 16 soil samples were collected and analyzed.
- Collection, laboratory analysis, and reporting of six groundwater samples from temporary monitoring wells via a peristaltic pump and disposable polyethylene tubing for analysis of VOCs, SVOCs, and metals.
- Collection, laboratory analysis, and reporting of four soil vapor samples from the area beneath the existing buildings for analysis of VOCs via Environmental Protection Agency (EPA) Method TO-15.

The laboratory analytical results for samples revealed the following:

Soil

- No VOC exceedances of the NYSDEC Restricted Residential SCOs (RRSCOs) were reported.
- Concentrations of several SVOCs [benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3cd)pyrene and 2-methylnaphthalene] were reported above the NYSDEC RRSCOs.
- Concentrations of metals (arsenic, copper, lead, and mercury) were reported above the NYSDEC RRSCOs.
- No PCB exceedances of the NYSDEC RRSCOs were reported.

Groundwater

- Several VOCs, including benzene, ethylbenzene, isopropylbenzene, total xylenes, and naphthalene, were detected in the groundwater sample collected from SB-3 (in the southeast portion of the Site at concentrations exceeding the NYSDEC TOGS AWQSGVs Class GA groundwater standards.
- One SVOC [benzo(a)pyrene] was detected in all (six total) of the groundwater samples exceeding the NYSDEC AWQSGVs TOGS Class GA groundwater standards.
- Concentrations of metals were not detected above the laboratory method detection limit in the samples collected.

Soil Vapor

- PCE was detected in all four sub-slab soil vapors samples with concentrations ranging from 144 micrograms per cubic meter (µg/m^3) to 6,850 µg/m^3. TCE was detected in two of the four soil vapor samples with concentrations ranging from 6.4 µg/m^3 to 51 µg/m^3.
- Ethylbenzene was detected in the two sub-slab soil vapor samples collected beneath the southeast corner of the building with concentrations ranging from 381 µg/m^3 to 565 µg/m^3.

Remedial Investigation – Former Excelsior Bag, Yonkers, NY, AKRF, Inc., November 2021

Surface Soil

VOCs were not detected at concentrations above their NYSDEC RRSCOs and/or Protection of Groundwater SCOs (PGWSCOs) in any of the surface soil samples.

Six SVOCs consisting of polycyclic aromatic hydrocarbons (PAHs), including: benzo(a)anthracene at a concentration of 2.1 milligrams per kilogram (mg/kg), benzo(a)pyrene at a concentration of 1.9 mg/kg, benzo(b)fluoranthene at a concentration of 2.6 mg/kg, chrysene at a concentration of 1.9 mg/kg, dibenzo(a,h)anthracene at a concentration of 0.35 mg/kg, and indeno(1,2,3-cd)pyrene at a concentration of 1.3 mg/kg, were detected at concentrations above their respective RRSCOs and/or PGWSCOs in one of the two surface soil samples analyzed (RI-SS-01_0-0.5_20200901).

Pesticides and herbicides were not detected in any of the surface soil samples above RRSCOs and/or PGWSCOs.

PCBs were not detected in any of the surface soil samples above RRSCOs and/or PGWSCOs.

Lead was detected above its RRSCO and PGWSCO in one of the two surface soil samples analyzed (RI-SS-01_0-0.5_20200901) at a concentration of 857 mg/kg.

Per- and polyfluoroalkyl substances (PFAS) were not detected in any of the surface soil samples above Restricted Residential (RR) and/or Protection of Groundwater (PGW) PFAS Guidance Values.

Fill Materials

Six VOCs were detected at concentrations above their respective PGWSCOs, but below respective RRSCOs (with the exception of benzene which was detected at a concentration equal to its RRSCO) in 12 fill material samples (inclusive of two blind duplicate samples) including: 1,2-dichloroethane in two samples at concentrations up to 0.66 mg/kg, acetone in nine samples at concentrations up to 0.13 mg/kg, benzene in one sample at a concentration of 4.8 mg/kg, methyl ethyl ketone (2-butanone) in one sample at a concentration of 0.31 mg/kg, toluene in one sample at a concentration of 2.6 mg/kg, and xylenes in one sample at a concentration of 13 mg/kg.

SVOCs consisting of PAHs were detected at concentrations above their respective RRSCOs and/or PGWSCOs in 20 fill material samples (inclusive of two blind duplicate samples) including: benzo(a)anthracene at concentrations up to 70 mg/kg, benzo(a)pyrene at concentrations up to 23 mg/kg, benzo(b)fluoranthene at concentrations up to 72 mg/kg, benzo(k)fluoranthene at concentrations up to 23 mg/kg, chrysene at concentrations up to 86 mg/kg, dibenzo(a,h)anthracene at concentrations up to 10 mg/kg, fluoranthene in one sample at a concentration of 130 mg/kg, indeno(1,2,3-cd)pyrene at concentrations up to 37 mg/kg, naphthalene in one sample at a concentration of 21 mg/kg, phenanthrene in one sample at a concentration of 160 mg/kg, and pyrene in one sample at a concentration of 200 mg/kg.

Pesticides/herbicides were not detected in any of the fill material samples above RRSCOs and/or PGWSCOs

PCBs were not detected in any of the fill material samples above RRSCOs and/or PGWSCOs.

Seven metals were detected at concentrations above their respective RRSCOs and/or PGWSCOs in 24 fill material samples (inclusive of three blind duplicate samples) including: arsenic at concentrations up to 23.7 mg/kg, cadmium in one sample at a concentration of 9.87 mg/kg, copper at concentrations up to 3,990 mg/kg, lead at concentrations up to 3,250 mg/kg, mercury at concentrations up to 17 mg/kg, nickel at concentrations up to 156 mg/kg, and selenium in one sample at a concentration of 4.6 mg/kg.

PFAS were not detected in any of the fill material samples above RR and/or PGW PFAS Guidance Values.

Intermediate Native Soil (Above the Hudson River Sediments)

VOCs were detected at concentrations above their respective PGWSCOs and/or RRSCOs in 11 intermediate soil samples including: 1,2,4-trimethylbenzene at concentrations up to 170 mg/kg, 1,3,5-trimethylbenzene (mesitylene) at concentrations up to 49 mg/kg, acetone at concentrations up to 0.085 mg/kg, benzene at concentrations up to 2.1 mg/kg, ethylbenzene at concentrations up to 200 mg/kg, methyl ethyl ketone (2-butanone) in one sample at a concentration of 0.28 mg/kg, n-propylbenzene at concentrations up to 11 mg/kg, toluene in one sample at a concentration of 2.1 mg/kg, and xylenes at concentrations up to 94 mg/kg.

SVOCs were detected at concentrations above their respective RRSCOs and/or PGWSCOs in eight intermediate soil samples including: acenaphthene at concentrations up to 690 mg/kg, acenaphthylene in one sample at a concentration of 140 mg/kg, anthracene at concentrations up to 300 mg/kg, benzo(a)anthracene at concentrations up to 200 mg/kg, benzo(a)pyrene at concentrations up to 220 mg/kg, benzo(b)fluoranthene at concentrations up to 180 mg/kg, benzo(k)fluoranthene at concentrations up to 53 mg/kg, chrysene at concentrations up to 220 mg/kg, dibenzo(a,h)anthracene in five samples at concentrations up to 10 mg/kg, dibenzofuran in one sample at a concentration of 64 mg/kg, fluoranthene at concentrations up to 370 mg/kg, fluorene at concentrations up to 310 mg/kg, indeno(1,2,3-cd)pyrene at concentrations up to 89 mg/kg, naphthalene at concentrations up to 2,400 mg/kg, phenanthrene at concentrations up to 1,000 mg/kg, and pyrene at concentrations up to 490 mg/kg.

Three metals were detected at concentrations above their respective RRSCOs and/or PGWSCOs in three intermediate soil samples (inclusive of one blind duplicate sample) including: arsenic at concentrations up to 19.1 mg/kg, lead at concentrations up to 3,460 mg/kg, and mercury at concentrations up to 3.56 mg/kg.

Coal Tar in Intermediate Native Soil

DNAPL (i.e., coal tar) impacts, coal tar odors, and elevated PID readings were encountered in the south-central portion of the Site directly above the Hudson River sediment confining layer at

depths ranging from approximately 20 to 35 feet below ground surface. The coal tar impacts were observed at thicknesses of up to 10 feet (ranging from a light coating to fully saturated DNAPL intervals) in RI soil borings RI-SB-15, RI-SB-17, RI-SB-18, and RI-SB-27 (with a maximum PID reading of 140.3 ppm in RI-SB-27 at 34 feet bgs). Sheen and/or coal tar odors were also documented in RI soil borings RI-SB-16, RI-SB-29, RI-SB-30 (with a maximum PID reading of 7.2 ppm in RI-SB-29 at 29 feet bgs), and SRI soil borings SRI-SB-03, SRI-SB-05, and SRI-SB-06 (with a maximum PID reading of 42.0 ppm in SRI-SB-03 at 22 feet bgs).

Deep Native Soil (Above the Glacial Till)

VOCs were detected at concentrations above their respective PGWSCOs and/or RRSCOs in two deep soil samples and in the respective blind duplicate sample including: 1,2,4-trimethylbenzene at concentrations up to 41 mg/kg, 1,3,5-trimethylbenzene in one sample at a concentration of 11 mg/kg, benzene at concentrations up to 12 mg/kg, ethylbenzene at concentrations up to 21 mg/kg, toluene at concentrations up to 70 mg/kg, and xylenes at concentrations up to 86 mg/kg.

SVOCs were detected at concentrations above their respective RRSCOs and/or PGWSCOs in one deep soil sample and in the respective blind duplicate sample including: benzo(a)anthracene at concentrations up to 34 mg/kg, benzo(a)pyrene at concentrations up to 26 mg/kg, benzo(b)fluoranthene at concentrations up to 19 mg/kg, benzo(k)fluoranthene at concentrations up to 7.9 mg/kg, chrysene at concentrations up to 32 mg/kg, dibenzo(a,h)anthracene at concentrations up to 2.8 mg/kg, dibenzofuran at a concentration of 7.1 mg/kg, fluorene at concentrations up to 80 mg/kg, indeno(1,2,3-cd)pyrene at concentrations up to 9.2 mg/kg, naphthalene at concentrations up to 830 mg/kg, and phenanthrene at concentrations up to 190 mg/kg.

Coal Tar in Deep Native Soil

Trace amounts of separate phase DNAPL, (i.e., coal tar), coal tar odors, and elevated PID readings were observed directly above the glacial till deep confining layer in SRI-SB-05 from approximately 98 to 103 feet bgs. Separate phase DNAPL (i.e., coal tar) was not encountered in any other SRI boring above the glacial till deep confining layer; however, sheen, coal tar odors, and/or elevated PID readings were encountered in SRI-SB-04 and SRI-SB-06 above the glacial till deep confining layer at depths ranging from approximately 83 to 118 feet bgs and 117 to 150 feet bgs, respectively.

Groundwater

VOCs were not detected in any of the groundwater samples above NYSDEC AWQSGVs (Class GA).

SVOCs were detected at concentrations above AWQSGVs in eight groundwater samples (inclusive of one blind duplicate sample) including: benzo(a)anthracene at concentrations up to 0.41 microgram per liter (µg/L), benzo(a)pyrene at concentrations up to 0.3 µg/L, benzo(b)fluoranthene at concentrations up to 0.32 µg/L, benzo(k)fluoranthene at concentrations up to 0.33 µg/L, chrysene at concentrations up to 0.36 µg/L, indeno(1,2,3-cd)pyrene at concentrations up to 0.14 µg/L, and naphthalene in one sample at a concentration of 13 µg/L.

Pesticides were not detected above laboratory reporting limits in any of the groundwater samples.

PCBs were not detected above laboratory reporting limits in any of the groundwater samples.

Metals were detected at concentrations above their AWQSGVs in the nine total (unfiltered) groundwater samples (inclusive of the one blind duplicate sample) including: iron in all nine samples at concentrations up to 23,700 µg/L, magnesium at concentrations up to 208,000 µg/L, manganese at concentrations up to 948.6 µg/L, and sodium in all nine samples at concentrations up to 1,900,000 µg/L.

Metals were detected at concentrations above their AWQSGVs in the nine dissolved (filtered) groundwater samples (inclusive of the one blind duplicate sample) including: iron in all nine samples at concentrations up to 22,800 µg/L, magnesium at concentrations up to 212,000 µg/L, manganese at concentrations up to 917.1 µg/L, selenium in one sample at a concentration of 37.2 µg/L, and sodium in all nine samples at concentrations up to 1,950,000 µg/L.

PFAS were detected above NYSDEC PFAS Screening Levels in all of the groundwater samples except for RI-MW-07_20210413 and blind duplicate sample RI-MW-X01_20210413 (collected from RI-MW-03). Perfluorooctanoic acid (PFOA) was detected above its NYSDEC PFAS Screening Level of 10 ng/l in the seven samples and the one duplicate sample at concentrations up to 42.6 ng/l; perfluorooctanesulfonic acid (PFOS) was detected above its NYSDEC PFAS Screening Level of 10 ng/l in two samples at concentrations up to 17.5 ng/l; and 6:2 fluorotelomer sulfonate was detected above its NYSDEC PFAS Screening Level of 100 ng/l in one sample at a concentration of 144 ng/l.

1,4-Dioxane was not detected in any of the groundwater samples.

Soil Vapor

Petroleum-related and other VOCs, including acetone, benzene, toluene, ethylbenzene, m,p- and o-xylene (collectively referred to as "BTEX"), 1,3-butadiene, 2,2,4-trimethylpentane, 2-hexanone, 4-ethyltoluene, carbon disulfide, chloroform, cyclohexane, dichlorodifluoromethane, ethanol, isopropanol, isopropanol, methyl ethyl ketone (2-butanone), n-heptane, n-hexane, and tert-butyl were detected in one or more soil vapor samples at concentrations up to 4,570 µg/m^3 [methyl ethyl ketone (2-butanone) in RI-SV-03_20210413].

Solvent-related compounds including, PCE and 1,1,1-trichloroethane (111-TCA) were detected one or more soil vapor samples (111-TCA detected in RI-SV-05_20210413 at a concentration of 96 µg/m^3 and PCE detected in RI-SV-01_20210405 and RI-SV-04_20210413790, with a maximum concentration of 95.6 µg/m^3 in RI-SV-04_20210413).

Supplementary Investigation Report #1 – Former Excelsior Bag, Yonkers, NY, AKRF, Inc., January 2022

Eight shallow fill soil samples, collected and analyzed from seven soil boring locations advanced during the RI, identified total metal concentrations that warranted additional sampling and analysis for their respective hazardous waste criteria. Based on the findings of the Supplementary Investigation #1, the seven Hazardous Metals potential source areas evaluated were not considered source areas necessitating removal as part of the Site remedy.

4.0 INTERIM REMEDIAL MEASURES

Based upon recent correspondence with NYSDEC, it is anticipated the Site will be remediated under a forthcoming RAWP to achieve Site-specific Track 4 SCOs. To facilitate the anticipated Track 4 remedy (to be fully addressed in the forthcoming RAWP), IRM activities will include the following:

- Removal of the suspected abandoned in-place UST(s) identified in the southeast portion of the Site. Two large geophysical anomalies indicative of potential USTs were identified in the southeast portion of the Site during the geophysical survey conducted in April 2021 during the RI. In addition, documentation for two 2,900-gallon USTs formerly containing alcohol-based solvents were noted in the September 2017 Phase I ESA prepared by Langan (also identified in the southeast portion of the Site). According to information provided in the EDR Report reviewed as part of Langan's ESA, a tank test failure was reported to NYSDEC on August 13, 1994 and spill case no. 9406513 was assigned. According to the spill case narrative, the tank (only one tank was discussed in the spill case narrative) was pumped out and soil excavation was performed to remove impacted material from around the tank. The spill case was closed by NYSDEC on April 28, 2010. Details with respect to the date of soil excavation, soil quantities removed, and samples collected (if any) were not provided. However, based on the information provided, the spill case was addressed to the satisfaction of NYSDEC. Excavation for the IRM will include removal of any fill ports, vent lines, etc. should they be encountered. UST removal procedures are further detailed in Section 4.2;
- Removal of soil materials with total Target Compound List (TCL) SVOC concentrations in excess of 500 mg/kg. Total TCL SVOCs were detected at concentrations above 500 mg/kg in one soil sample collected from RI soil boring RI-SB-24 (detected in RI-SB-24_1-3_20210408 at a concentration of 908 mg/kg) and is targeted for removal. SVOC source area excavation procedures are further detailed in Section 4.3;
- Excavations will also include removal of any grossly contaminated media (as defined in DER-10) should they be encountered;
- Collection of sidewall and bottom of excavation confirmatory endpoint sampling as further detailed in Section 4.7;
- Excavated materials will be stockpiled (and segregated based on excavation area and/or if grossly contaminated media is identified) and characterized for off-site disposal. Based upon the sampling results, one or more appropriately permitted waste disposal facilities will be selected and materials will be transported for off-site disposal in accordance with local, state, and federal regulations. Soil waste characterization and disposal procedures are further detailed in Section 4.8 and Section 4.9, respectively; and
- Backfilling of excavation areas with NYSDEC-approved clean backfill materials as further detailed in Section 4.10.

The following sections outline the scope of work and procedures for implementation of the IRM field activities noted above, including, monitoring during excavation/UST removal and backfilling activities, Site controls, and handling and disposal of contaminated materials. All IRM activities will be conducted under the oversight of a Qualified Environmental Professional (QEP). Intrusive work will also be conducted in accordance with procedures set forth in the HASP and CAMP provided as Appendix A.

4.1 Site Preparation

A Site construction fence will be installed and all necessary permits pertaining to excavation and UST removal will be procured from the City of Yonkers and Westchester County Department of

Health (WCDOH) prior to starting work. Utility mark-outs will be performed prior to undertaking any excavation. The Volunteer and its contractors will be solely responsible for the identification of utilities that might be affected by excavation work and implementation of all required, appropriate, or necessary health and safety measures.

Electric, gas, sewer, and water utilities were disconnected/abandoned in-place at the Site in February 2021 prior to building demolition, as required to obtain a City of Yonkers Demolition Permit.

Prior to excavation, the lateral extents of the UST and the SVOC source excavation areas will be marked out in the field by a New York State-licensed surveyor using previous geophysical survey and soil boring survey data obtained during the 2020-2021 RI. The UST and SVOC source area excavation extents are further detailed below and shown on Figure 3.

4.2 UST Removal

Two large geophysical anomalies indicative of USTs were identified in the southeast portion of the Site during the geophysical survey conducted in April 2021 during the RI. In addition, evidence of two 2,900-gallon USTs formerly containing alcohol-based solvents were noted in the September 2017 Phase I ESA prepared by Langan (also identified in the southeast portion of the Site). The location of the suspected USTs are shown on Figure 3.

As part of the IRM, the suspected UST area will be investigated to confirm their existence, and if encountered, removed from the Site in accordance with NYSDEC guidance by a City of Yonkers certified tank removal contractor. Prior to removal City of Yonkers Department of Housing and Buildings tank removal permit(s) will be acquired as necessary; and appropriate Petroleum Bulk Storage (PBS) registrations will be filed with WCDOH. After removal of the USTs, the Yonkers Fire Department will be contacted to perform a tank removal inspection and appropriate tank closure documentation will be submitted to the City of Yonkers Department of Housings and Buildings for permit close out. In addition, WCDOH PBS facility registration will also be updated as necessary.

Following UST removal, the UST excavation limits will be field screened with a PID to determine if grossly contaminated materials are present and supplemental excavation is warranted prior to endpoint sample collection (as further detailed in Section 4.7). Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline, if deemed appropriate by the NYSDEC Project Manager.

Excavation for the USTs will also include the removal of associated piping, fill ports, vent lines, etc. should they be encountered. Following any necessary cleaning by the Contractor, the UST scrap metal generated during the removal will be transported off-site for recycling. In addition, any liquids encountered within the USTs will be handled and disposed of in accordance with Section 4.5.

Approximately 100 tons of soil/fill are anticipated to be removed as part of UST excavation activities. Excavated materials will be stockpiled next to the excavation area for waste characterization sampling. Grossly contaminated media, if encountered, will be segregated into a separate stockpile. The stockpiles will be lined with plastic sheeting to avoid contaminated materials from contacting surrounding surface grade soil materials. If practicable, existing on-site impervious surfaces (e.g., concrete slab or asphalt) will be used for stockpile staging areas. Appropriate stockpile erosion and sediment control measures will also be implemented in compliance with Section 4.11.

UST excavation confirmatory endpoint sampling will be conducted in accordance with Section 4.7. Soil waste characterization and off-site disposal procedures will be conducted in accordance

with Section 4.8 and Section 4.9, respectively. Following confirmatory endpoint sampling, the excavation area will be backfilled in accordance with Section 4.10.

The final excavation extents, disposal volumes, and UST closure documentation will be documented in the Construction Completion Report (CCR).

4.3 SVOC Source Excavation Area

Soil materials with total TCL SVOC concentrations in excess of 500 mg/kg are considered source areas targeted for removal as part of this IRMWP.

Total TCL SVOCs were detected at concentrations above 500 mg/kg in one soil sample collected from RI soil boring RI-SB-24 (detected in RI-SB-24_1-3_20210408 at a concentration of 908 mg/kg). To remove soil materials representative of RI-SB-24_1-3_20210408, an approximately 10-foot by 10-foot (100-square foot) area centered on soil boring RI-SB-24 will be excavated vertically to 5 feet below ground surface. The proposed excavation area surrounding RI-SB-24 (located in the southeast portion of the Site) is shown on Figure 3.

The SVOC source excavation area limits will be field screened with a PID to determine if grossly contaminated materials are present and supplemental excavation is warranted prior to endpoint sample collection (further detailed in Section 4.7).

Approximately 25 tons of soil/fill are anticipated to be removed as part of SVOC source excavation activities. Excavated materials will be stockpiled next to the excavation area for waste characterization sampling. Grossly contaminated media, if encountered, will be segregated into a separate stockpile. The stockpiles will be lined with plastic sheeting to avoid contaminated materials from contacting surrounding surface grade soil materials. If practicable, existing on-site impervious surfaces (e.g., concrete slab or asphalt) will be used for stockpile staging areas. Appropriate stockpile erosion and sediment control measures will also be implemented in compliance with Section 4.11.

SVOC source excavation confirmatory endpoint sampling will be conducted in accordance with Section 4.7. Soil waste characterization and off-site disposal procedures will be conducted in accordance with Section 4.8 and Section 4.9, respectively. Following confirmatory endpoint sampling, the excavation area will be backfilled in accordance with Section 4.10.

The final excavation extents and disposal volumes will be documented in the CCR.

4.4 Support of Excavation (SOE)

Support of excavation (SOE) will be installed as necessary to enable excavation of contaminated soil and to prevent compromising adjacent properties, structures, and roadways. Expected forms of SOE on Site are trench boxes and benched excavations. These activities will comply with any local and state-controlled inspections.

4.5 Fluids Management

Based on the estimated depth to groundwater in the southeast portion of the Site (approximately 6 feet below grade), localized dewatering is not anticipated to be a necessary component for completing the IRM activities. However, any liquids to be removed from the Site (i.e., UST liquids/sludges) will be handled, transported, and disposed in accordance with applicable local, State, and Federal regulations.

4.6 Groundwater Treatment

Based on soil and groundwater conditions observed in the southeast portion of the Site during the 2020-2021 RI, grossly contaminated soil and/or shallow non-aqueous phase liquids (NAPL) is not expected to be encountered at or below the groundwater table; therefore, excavation below

the groundwater table and/or treatment of contaminated groundwater is not anticipated to be required.

However, in the event grossly contaminated soil and/or shallow NAPL is encountered at the groundwater table, remedial excavation will be performed in the wet (i.e., without construction dewatering efforts) and will extend approximately 1-2 feet below the observed groundwater table, to the extent practicable, to address contamination that may be present in the smear zone (soil/groundwater interface). Due to proximity of the excavation areas to the neighboring property to the south and tidally influenced groundwater conditions, remedial excavations deeper than 1-2 feet below the groundwater table and localized dewatering are not considered practicable for the proposed IRM activities.

If shallow NAPL is observed at the water table during the IRM activities, a bioremediation program as an added contingency measure will be implemented by application of Regenesis® oxygen release compound (ORC) to the open excavation area in the form of ORC Advanced® Pellets (or similar). The ORC Advanced® Pellets release oxygen and form simple calcium hydroxide and water upon hydration.

The lateral extent of the excavation area requiring bioremediation, if at all, is unknown and will be determined in the field. Based on the estimated lateral extents of the IRM excavation areas (approximately 500 square feet), a dosing rate of 0.2 pounds of ORC Advanced® Pellets per square foot of open excavation area, and a contingency factor of 25 percent, the Volunteer will be prepared for the placement of up to 125 pounds of ORC Advanced® Pellets. Application of ORC, if warranted, will be documented in the CCR, and post-IRM groundwater monitoring will be included as a component of the forthcoming RAWP and/or subsequent Site Management Plan (SMP).

4.7 Post-Excavation Endpoint Sampling

To confirm that remaining soil does not exceed the proposed cleanup standard, post-excavation endpoint samples will be collected from the suspected UST and SVOC source excavation areas. The sampling frequency will be conducted in accordance with NYSDEC DER-10 Section 5.4. Based on the estimated lateral and horizontal extents of the suspected UST and SVOC source excavation areas, four sidewall and one bottom of excavation sample per excavation area will be collected (with one exception as noted below for the SVOC source excavation area). Confirmatory endpoint sample locations are shown on Figure 3.

UST Excavation Area

In the event that USTs are encountered and removed, five endpoint samples consisting of four sidewalls and one bottom sample will be obtained following removal of the tanks and any encountered grossly contaminated media. UST excavation confirmatory endpoint samples will be submitted for laboratory analysis for TCL VOCs by EPA Method 8260 and TCL SVOCs by EPA Method 8270.

SVOC Source Excavation Area

Following removal of the 10-foot by 10-foot by 5-foot deep SVOC source excavation area and any encountered grossly contaminated media, four sidewall confirmatory endpoint samples will be collected (one from each sidewall). The previously collected soil sample collected from RI-SB-24 from 5 to 7 feet below ground surface (RI-SB-24_5-7_20210408) detected total SVOCs at 61.82 mg./kg (below the threshold of 500 mg/kg) and is therefore proposed to represent the bottom of excavation endpoint sample (in the event no grossly contaminated media is encountered at 5 feet below ground surface). SVOC source excavation endpoint samples will be submitted for laboratory analysis for TCL SVOCs by EPA Method 8270.

The samples will be containerized in accordance with EPA analytical protocols and submitted to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory for analysis. The laboratory will compile and submit the data package using NYSDEC Category B deliverables. Further details regarding the specific sampling methodology and analytical procedures are presented in the Quality Assurance Project Plan (QAPP), included as Appendix B.

In the event an endpoint sample fails the following applicable criteria, the excavation will extend horizontally and/or vertically, to the extent practicable, and the sample will be recollected:

- TCL VOCs in excess of their respective RRSCOs and/or PGWSCOs (UST excavation area only); and/or
- Total TCL SVOC concentrations in excess of 500 mg/kg.

This process will be repeated until a passing endpoint sample is collected or the excavation cannot extend further (e.g., groundwater table or property boundary is encountered).

4.8 Soil Waste Characterization for Off-Site Disposal

All soil material generated from IRM excavation activities are proposed for off-site disposal. Waste characterization samples are proposed to be collected following excavation from stockpiled materials (segregated based on excavation area and/or if grossly contaminated media is identified).

Waste characterization sampling for off-site disposal will be performed in a manner required by the intended receiving facility and in conformance with its applicable permits. Selected off-site disposal facility information, including facility name(s) and location(s), facility acceptance letter(s), and estimated disposal quantity(ies) will be submitted to the NYSDEC Project Manager for approval prior to commencing disposal activities. Actual disposal quantities and associated disposal documentation (i.e., facility acceptance letters, and manifests/bills of lading) will be reported in the CCR.

4.9 Materials Transport Off-Site

Non-hazardous historic fill and contaminated soils taken off-site will be handled consistent with 6 NYCRR Parts 360, 361, 362, 363, 364 and 365. Material that does not meet Unrestricted Use SCOs is prohibited from being taken to a New York State construction and demolition (C&D) debris recovery facility (6 NYCRR Subpart 360-15 registered or permitted facility). Scrap metal generated during UST removal will be transported off-site as C&D for recycling (following any necessary cleaning performed by the certified tank removal contractor).

Although not anticipated, if hazardous waste is encountered, the materials will be stored, transported, and disposed of in compliance with applicable local, state, and federal regulations and under hazardous waste manifesting procedures.

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364 and New York State Department of Transit (NYSDOT) requirements. Haulers will be appropriately licensed and trucks properly placarded.

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 designated truck wash area will be operated on-Site, as appropriate, by the Contractor. The Contractor and QEP, or personnel working under a QEP, will be responsible for ensuring that all

outbound trucks containing excavated material from an area with existing contamination will be washed at the truck wash before leaving the Site until the activities performed under this section are complete. Truck wash fluids, if generated, will be collected, and properly disposed of in accordance with all applicable rules and regulations.

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

The QEP and Contractor will be responsible for ensuring that all egress points for truck and equipment transport from the site are clean of dirt and other materials derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials. Material accumulated from the street cleaning and egress cleaning activities will be disposed off-site at a permitted landfill facility in accordance with all applicable local, State, and Federal regulations.

The truck transport route for trucks leaving the Site must comply with the City of Yonkers and Westchester County, New York published truck traffic routes. Trucks loaded with Site materials will exit the vicinity of the Site using only these approved truck routes. This is the most appropriate route and takes into account:

(a) limiting transport through residential areas and past sensitive Sites;

(b) use of city mapped truck routes;

(c) prohibiting off-Site queuing of trucks entering the facility;

(d) limiting total distance to major highways;

(e) promoting safety in access to highways;

(f) overall safety in transport; and

(g) community input where necessary.

These routes also have to be pre-approved by City of Yonkers authorities.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site in accordance with local and state regulations.

Queuing of trucks will be performed on-Site, to the extent feasible, to minimize off-Site disturbance. The number and duration of trucks lined up outside the Site entrance will be minimized through efficient scheduling.

4.10 Backfill from Off-Site Sources

All materials proposed for import onto the site be evaluated for compliance with the criteria detailed in this Section prior to receipt at the Site. If the proposed fill materials are in compliance with the criteria detailed below, a NYSDEC Request to Import Fill or Soil form (http://www.dec.ny.gov/regulations/67386.html), or similar import request package, will be prepared and submitted to the NYSDEC project manager for review. NYSDEC approval must be received for any fill material prior to importing, unless otherwise approved by the NYSDEC project manager.

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

Proposed import material will be sampled for the full suite of analytical parameters listed in DER-10 Appendix 5, PFAS, and 1,4-dioxane (as an SVOC). The sampling frequency will be in accordance with DER-10 Table 5.4(e)10 unless prior approval is obtained from the NYSDEC

project manager for modification of the sampling frequency. Materials meeting the cover soil quality standards established in 6 NYCRR 375-6.7(d) and the criteria established below may be imported to the Site for use within the Cover System or as backfill beneath the Cover System:

- Materials meeting RRES Use criteria listed in NYSDEC DER-10 Appendix 5 – Allowable Constituent Levels for Imported Fill or Soil for all constituents listed, and the RRES guidance values listed in the most up to date NYSDEC Sampling, Analysis, and Assessment of PFAS Guidance. Materials not meeting PGW guidance values for PFAS will be limited to use above the groundwater table. Supporting documentation will be submitted to NYSDEC for review/approval prior to import.
- Materials other than soil, meeting criteria detailed in DER-10 Section 5.4(e)5 may be imported without chemical testing. Supporting documentation will be submitted to NYSDEC for review/approval prior to import.

Soils that meet 'general' fill requirements under 6 NYCRR Part 360.13, but do not meet backfill or cover soil objectives for the Site, will not be imported onto the Site without prior approval by NYSDEC project manager.

Trucks entering the Site with imported soils will be securely covered with tight fitting covers. Imported soils will be directly unloaded for use as backfill or staged in compliance with appropriate erosion and sediment controls as further detailed in Section 4.11. Import materials will be inspected by the QEP during truck offload, and unacceptable materials observed, if any, will be segregated and returned to the custody of the source.

Actual import volumes and manifests/bills of lading will be included in the CCR.

4.11 Erosion and Sediment Control Measures

The potential off-site transport of sediment and/or dust potentially generated during soil excavation activities will be controlled by: lining/covering soil stockpiles and/or open excavations with 6-mil polyethylene sheeting; installation of haybales/silt fence surrounding stockpiles and areas of soil disturbance; backfilling open excavations with uncontaminated fill material; decontaminating equipment used for soil excavation/sampling; and providing drainage inlet protection for catch basins, as warranted. These measures will be installed according to the requirements of all applicable or relevant and appropriate Federal, State, and local laws.

4.12 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors off-Site and on-Site. Specific odor control methods to be used on a routine basis will include those defined in the CAMP. If nuisance odors are identified at the Site boundary, or if odor complaints are received, 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 any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the QEP, and any measures that are implemented will be reported in the CCR.

All necessary means will be employed to prevent on- and off-Site nuisances. At a minimum, these measures will include:

(a) limiting the area of open excavations and size of soil stockpiles;

(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 odorants in spray or misting systems; and

(f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-Site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

4.13 Community Air Monitoring Plan

Community air monitoring will be conducted during all intrusive Site activities in conformance with the NYSDOH Generic CAMP. Real-time monitoring for VOCs and particulate levels at the perimeter of the exclusion zone will be performed in accordance with the CAMP included as Attachment A.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

4.14 Quality Assurance/Quality Control

Measures will be taken to provide for Quality Assurance (QA) and maintain Quality Control (QC) of environmental sampling and remedial activities conducted under the IRM Work Plan. A QAPP that describes the QA/QC protocols and procedures that will be followed during implementation of the IRM is included in Appendix B. Adherence to the QAPP will ensure that defensible data will be obtained during the implementation of the IRM.

4.15 Surveying

The final limits of the remedial excavations will be surveyed by a New York State-licensed surveyor and incorporated into the CCR.

5.0 POST REMEDIATION REPORTING

Upon completion of the interim remedial measures, an IRM CCR will be prepared and submitted to NYSDEC and NYSDOH. The IRM CCR will include:

- Photographs of Site excavation;
- Air monitoring results and corrective actions taken (if required);
- Post-excavation endpoint sampling results collected during implementation of the interim remedial measures;
- Tabulated quantities of all material removed from the Site and associated manifests/bills of lading and certificates of disposal from the receiving facilities;
- Any tank removal or spill remediation (if appropriate) documentation; and
- Documentation of source approval and sampling for any imported backfill material.

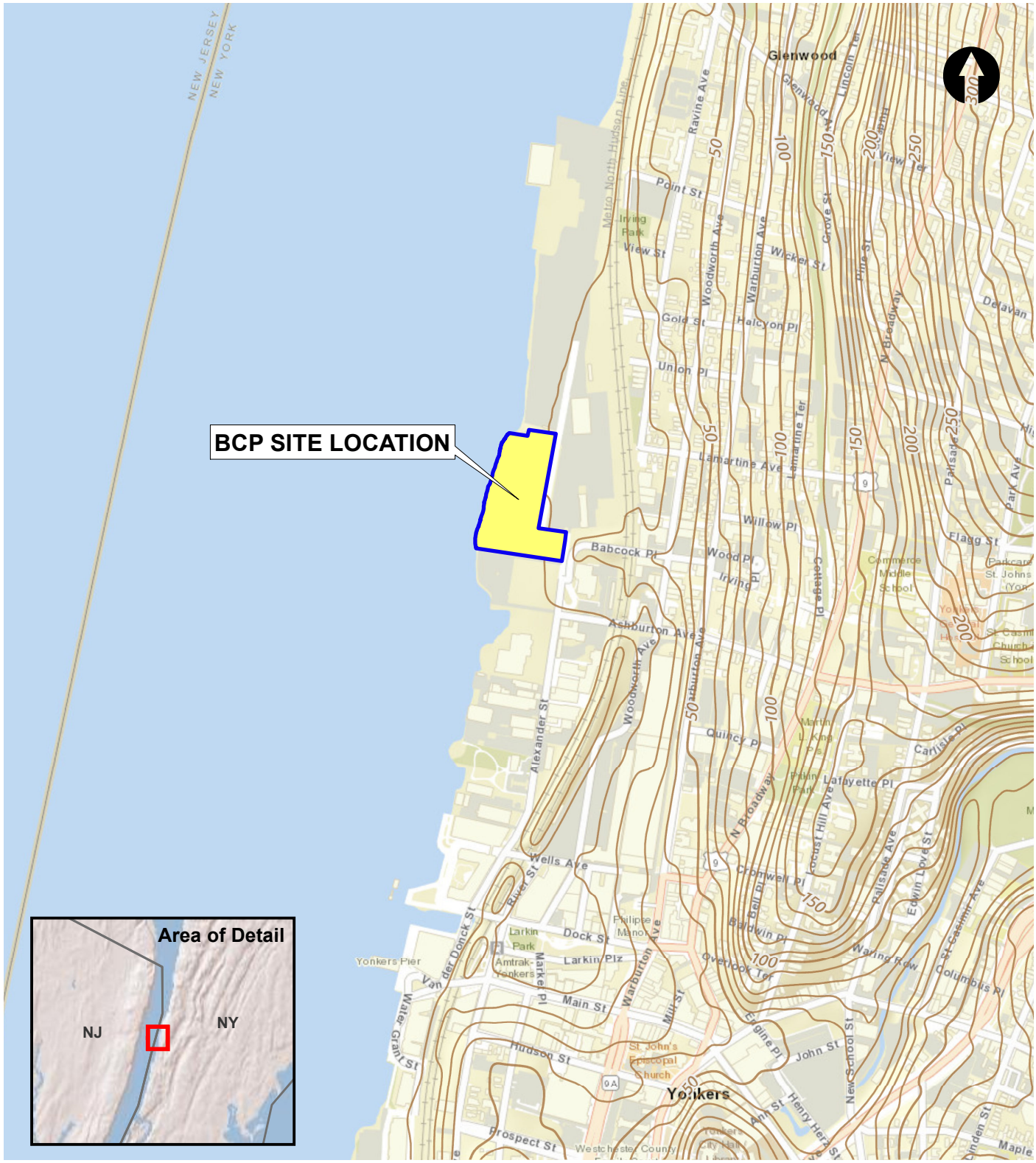
6.0 SCHEDULE OF WORK

The following tentative schedule has been developed for the project. The schedule would be subject to change to ensure that the data needs of the IRMWP, RAWP, etc. are met to the satisfaction of the NYSDEC.

Remedial Schedule

Activity	Time To Complete
SIR #1 and IRMWP submitted to NYSDEC	January 2022
NYSDEC approval of SIR #1 and IRMWP	March 2022
Implement NYSDEC-approved IRMWP	March 2022
NYSDEC approval of SIWP #2	February 2022
Implement NYSDEC-approved SIWP #2	February 2022
SIR #2 submitted to NYSDEC	May 2022
IRM CCR submitted to NYSDEC	June 2022
RAWP draft submitted to NYSDEC	July 2022
45-day Public Comment Period (Environmental News Bulletin, Newspaper)	September 2022
Receive NYSDEC comments on draft RAWP and submit revised RAWP to NYSDEC	October 2022
NYSDEC approves RAWP and issues Decision Document (DD) and Remedial/Construction Fact Sheet	November 2022
Begin redevelopment (construction) with implementation of RAWP	December 2022
Submittal of Environmental Easement Package (if required)	September 2024
SMP draft submitted to NYSDEC	October 2024
Final Engineering Report (FER) draft and Fact Sheet submitted to NYSDEC	November 2024
NYSDEC and NYSDOH Approval of FER and SMP	November 2024
Issue Certificate of Completion (COC)	December 2024

FIGURES



Service Layer Credits: ESRI Worlwide Street Map data; 2019.

Map Source - BCP Site Boundary from Ward Carpenter Engineers, Inc. "Survey of Property prepared for Extell Hudson Waterfront LLC in the City of Yonkers" - dated May 16, 2019, revised June 26, 2019.

AKRF
440 Park Avenue South, New York, NY 10016

FORMER EXCELSIOR BAG
Yonkers, New York

BCP SITE LOCATION

DATE
1/24/2022

PROJECT NO.
200131

FIGURE
1

LEGEND

- BCP SITE BOUNDARY
- PROPOSED LOCATION OF FUTURE BUILDING
- SHALLOW SOIL BORING LOCATION
- INTERMEDIATE SOIL BORING LOCATION
- DEEP SOIL BORING LOCATION
- SOIL VAPOR POOINT LOCATION
- GROUNDWATER SAMPLE LOCATION
- SURFACE SOIL SAMPLE LOCATION
- AMBIENT AIR SAMPLE LOCATION
- DNAPL DELINEATION SOIL BORING LOCATION
- SUSPECTED ABANDONED IN-PLACE

NOTE: DUE TO SCALING CONSTRAINTS, SOME SAMPLE LOCATIONS SHOWN ON FIGURE 2 WERE SLIGHTLY REPOSITIONED TO AVOID OVERLAPPING SYMBOLS. IN ADDITION, EACH MONITORING WELL WAS INSTALLED WITHIN THE CO-LOCATED SOIL BORING. REFER TO APPENDIX F FOR SOIL BORING, GROUNDWATER MONITORING WELL, AND SOIL VAPOR POINT SURVEY DATA.

Aerial Source:
2018 New York State ITS GIS Orthoimagery

Map Sources:
BCP Site Boundary from Ward Carpenter Engineers, Inc.
"Survey of Property prepared for Extell Hudson Waterfront LLC in the City of Yonkers" - dated May 16, 2019, revised June 26, 2019.

Proposed Location of Future Building from PS&S, PC. "Utility Construction Phasing Plan Phase 1" - dated 5-13-2021.

0 50 100 200
SCALE IN FEET

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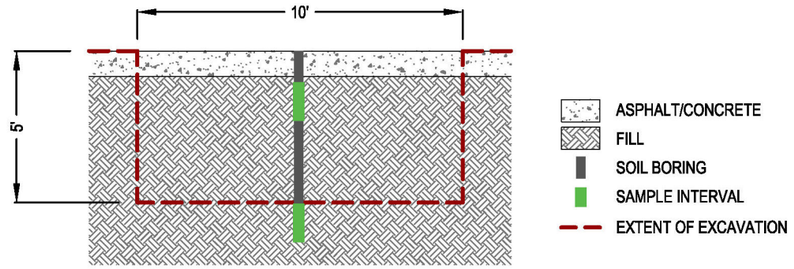
FORMER EXCELSIOR BAG
Yonkers, New York

BCP SITE AND SAMPLE LOCATION PLAN

DATE
1/24/2022

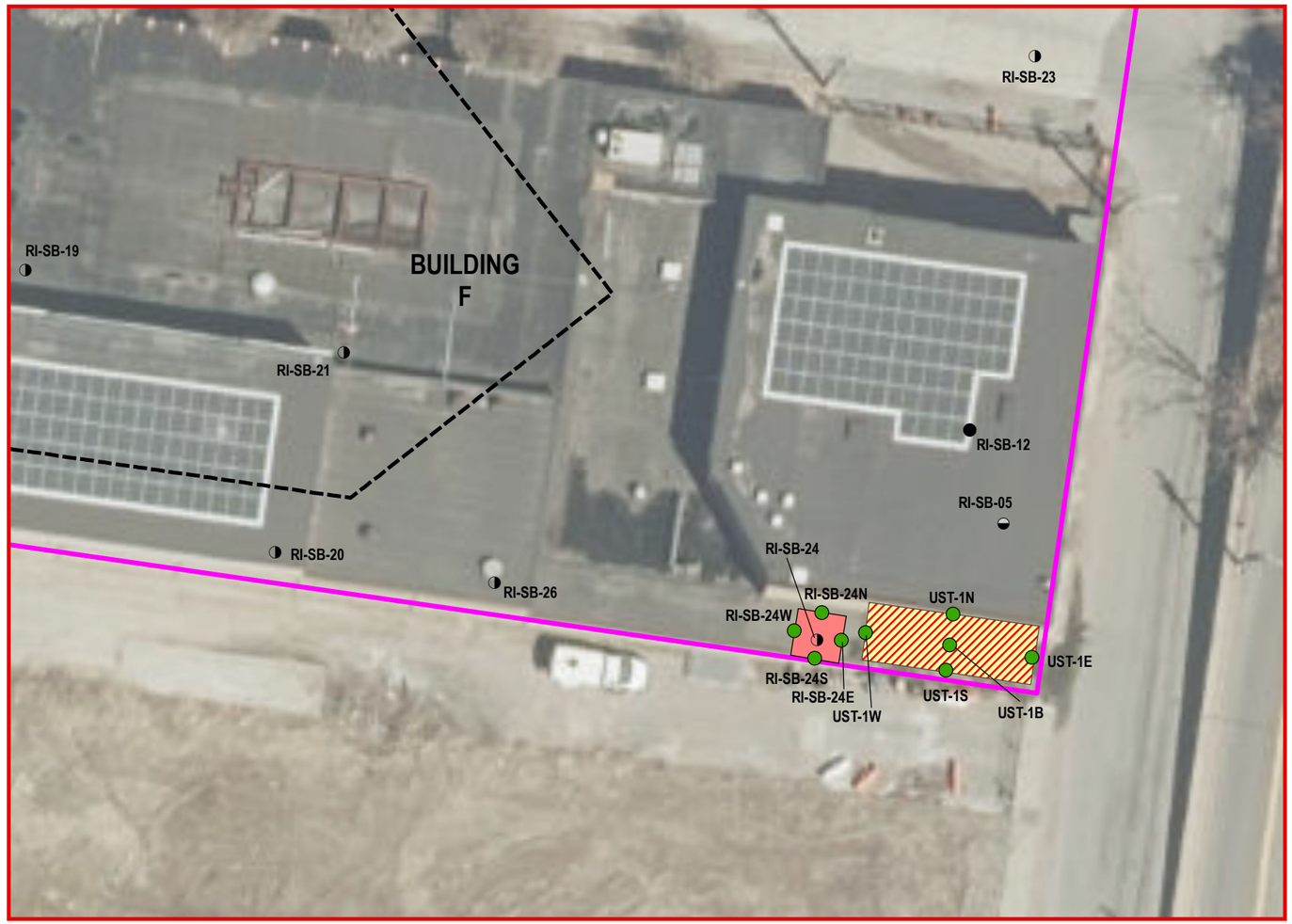
PROJECT NO.
200131

FIGURE
2



ASPHALT/CONCRETE
FILL
SOIL BORING
SAMPLE INTERVAL
EXTENT OF EXCAVATION

DETAIL 1 - RI-SB-24 SVOC SOURCE EXCAVATION AREA



KEY MAP
Scale: 1" = 200'

Notes:

1. Total SVOCs detected at concentrations above 500 mg/kg in shallow fill soil samples collected during the 2020-2021 RI are targeted for removal as part of this IRM Work Plan. To remove shallow fill materials representative of RI-SB-24_1-3_20210408, which reported total SVOC concentrations of 908 mg/kg, an approximately 10-foot by 10-foot (100-square foot) area centered on soil boring RI-SB-24 will be excavated vertically to 5 feet below ground surface. Sidewall confirmatory endpoint sampling will be conducted following excavation to confirm site-specific thresholds are met prior to backfilling. The previously collected soil sample RI-SB-24_5-7_20210408 detected total SVOCs at 61.82 mg./kg (below the threshold of 500 mg/kg) and is proposed to represent the bottom of excavation endpoint sample.

2. If present, the UST(s) suspected in the southeast portion of the Site will be removed and any identified grossly contaminated materials will be removed. Sidewall and bottom of excavation confirmatory endpoint sampling will be conducted following excavation in accordance with DER-10 prior to backfilling.

LEGEND

- BCP SITE BOUNDARY
- PROPOSED LOCATION OF FUTURE BUILDING
- SUSPECTED ABANDONED IN-PLACE UST (TO BE REMOVED AS PART OF IRM)
- 2020-2021 RI SHALLOW SOIL BORING LOCATION
- 2020-2021 RI INTERMEDIATE SOIL BORING LOCATION
- 2020-2021 RI DEEP SOIL BORING LOCATION
- PROPOSED ENDPOINT SAMPLE LOCATION
- SVOC SOURCE EXCAVATION AREA (TO BE REMOVED AS PART OF IRM)

Aerial Source:
2018 New York State ITS GIS Orthoimagery.

Map Sources:
BCP Site Boundary from Ward Carpenter Engineers, Inc.
"Survey of Property prepared for Extell Hudson Waterfront LLC in the City of Yonkers" - dated May 16, 2019, revised June 26, 2019.

Proposed Location of Future Building from PS&S, PC. "Utility Construction Phasing Plan Phase 1" - dated 5-13-2021.

Boring locations obtained from PS&S survey "Sample Location Map, dated 6/2/21 (revised 9/20/21)

0 15 30 60
SCALE IN FEET

AKRF
440 Park Avenue South, New York, NY 10016

FORMER EXCELSIOR BAG
Yonkers, New York

PROPOSED IRM SITE EXCAVATION AND ENDPOINT SAMPLING PLAN

DATE
1/24/2022

PROJECT NO.
200131

FIGURE
3

APPENDIX A

HEALTH AND SAFETY PLAN & COMMUNITY AIR MONITORING PLAN

FORMER EXCELSIOR BAG

YONKERS, NEW YORK

Health and Safety Plan & Community Air Monitoring Plan

NYSDEC BCP Site No.: C360190
AKRF Project Number: 200131

Prepared For:

New York State Department of Environmental Conservation
Division of Environmental Remediation, Remedial Bureau C
625 Broadway, 12th Floor
Albany, New York 12233

Prepared on Behalf Of:

Extell Hudson Waterfront LLC
805 Third Avenue, 7th Floor
New York, NY 10022

Prepared by:

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, New York 10016
212-696-0670

JANUARY 2022

TABLE OF CONTENTS

FIGURES

ATTACHMENTS

1.0 INTRODUCTION

This environmental Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) has been developed for the interim remedial measures (IRMs) conducted at the property located at 25, 35 and 45 Riverside Drive (f/k/a Alexander Street) in Yonkers, New York (hereafter referred to as the "Site") prior to the preparation and New York State Department of Environmental Conservation (NYSDEC) approval of a Remedial Action Work Plan (RAWP).

The Site is part of the area covered by a subdivision approved by the City of Yonkers Planning Board on April 11. 2018, for which the final subdivision map was filed with the Westchester County Clerk's office on January 24, 2020. The Site is now identified by the City of Yonkers Tax Map as Section 2, Block 2620, Lot 2, portion of Lot 9, Lots 10, 11 and 12, Fisherman Way, Colman Way, and portion of Riverside Drive. The Site is bound to the north by the Former BICC Cables Brownfield Cleanup Program (BCP) site (BCP No. C360051); to the east by Riverside Drive (f/k/a Alexander Street), followed by a Metropolitan Transit Authority (MTA) bus depot; to the southeast by the Greyston Bakery site (Volunteer Cleanup Program [VCP] site number V00361); to the south by the Polychrome Research and Development (R&D) BCP site (BCP No. C360099); and to the west by the Hudson River. A Site Location Map is provided as Figure 1.

The Site consists of an approximately 243,952-square foot vacant property with concrete/asphalt paved surfaces, a landscaped area (to the north), and revetment stone (along the western boundary adjacent to the Hudson River).

The IRMs will facilitate limited remediation at the Site [i.e., removal of the suspected underground storage tanks (USTs) and a semi-volatile organic compound (SVOC) source area located in the southeast corner of the Site] prior to the preparation and New York State Department of Environmental Conservation (NYSDEC) approval of a Remedial Action Work Plan (RAWP).

The purpose of this HASP and CAMP is to assign responsibilities, establish personnel protection standards and mandatory safety practices and procedures, and provide for contingencies that may arise during IRM activities conducted prior to approval of the forthcoming Remedial Action Work Plan (RAWP). The HASP is intended to minimize health and safety risks resulting from the known or potential presence of contaminated materials. This HASP also includes supplemental requirements to minimize potential exposure related to COVID-19 (see HASP Attachment A). The CAMP outlines appropriate monitoring, mitigation measures, and reporting requirements to ensure that the surrounding community is not affected during implementation of the redevelopment activities.

Previous environmental investigations conducted at the Site include a Phase I Environmental Site Assessment (ESA), prepared in February 2017 by Langan Engineering, Environmental, Surveying, and Landscape Architecture, D.P.C. (Langan), a Phase II ESA conducted in April 2017 by EBI Consulting (EBI), and a Remedial Investigation conducted in April 2021 by AKRF Inc. (AKRF). The previous investigations documented the following within the portion of the Site that is anticipated to be disturbed during Phase I construction prior to approval of the forthcoming RAWP [i.e., Lot 9 (Building D), Colman Way, and the northern portion of Lot 12 (waterfront esplanade)]:

- Historical fill materials containing semi-volatile organic compounds (SVOCs) [specifically, poly-aromatic hydrocarbon (PAH)] and metals (specifically lead and arsenic) at concentrations above NYSDEC Restricted Residential Soil Cleanup Objectives (RRES SCOs);

- SVOCs (specifically, PAHs) detected above NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) Ambient Water Quality Standards and Guidance Values (AWQSGV) Class GA in groundwater Site-wide; and
- Petroleum related volatile organic compounds (VOCs) (specifically benzene, toluene, ethylbenzene, and xylenes) and chlorinated VOCs [specifically tetrachloroethylene (PCE)] detected in soil vapor samples.

This HASP and CAMP does not discuss routine health and safety issues common to general construction and excavation, including, but not, limited to slips, trips, falls, shoring, and other physical hazards. All AKRF employees are directed that all work must be performed in accordance with the AKRF's Generic HASP and all Occupation Safety and Health Administration (OSHA)-applicable regulations for the work activities required for the project. All project personnel are furthermore directed that they are not permitted to enter Permit Required Confined Spaces (as defined by OSHA). For issues unrelated to contaminated materials, all non-AKRF employees are to be bound by all applicable OSHA regulations as well as any more stringent requirements specified by their employer in their corporate HASP or otherwise. AKRF is not responsible for providing oversight for issues unrelated to contaminated materials for non-employees. This oversight shall be the responsibility of the employer of that worker or other official designated by that employer.

2.0 HEALTH AND SAFETY GUIDELINES AND PROCEDURES

2.1 Hazard Evaluation

2.1.1 Hazards of Concern

Hazards of concern include organic and inorganic chemicals, and heat and/or cold stress.

2.1.2 Physical Characteristics

Physical characteristics of the hazards of concern include solid, aqueous, and vapor states.

2.1.3 Hazardous Materials

The Site-specific hazardous materials that may be encountered during redevelopment activities in the northern area of the Site include historical fill material, petroleum- and/or solvent-related VOCs, SVOCs (specifically PAHs), petroleum (fuel oils), and/or metals.

2.1.4 Chemicals of Concern

Chemicals	REL/PEL/STEL	Health Hazards
Arsenic	REL = 0.002 mg/m^3 PEL = 0.010 mg/m^3	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin, [potential occupational carcinogen]
Benzene	REL = 0.1 ppm PEL = 1 ppm STEL = 5 ppm	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude, dermatitis; bone marrow depression, potential occupational carcinogen.
Ethylbenzene	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma.
Fuel Oils (Kerosene, Fuel Oil No. 1 & No. 2, and Diesel Fuel Oil No. 2)	REL = 350 mg/m^3 PEL = 400 ppm	Nausea, irritation – eyes, hypertension, headache, light-headedness, loss of appetite, poor coordination; long-term exposure – kidney damage, blood clotting problems; potential carcinogen.
Lead	REL = 0.1 mg/m^3 PEL = 0.05 mg/m^3	Weakness, lassitude, insomnia; facial pallor, pale eye, anorexia, low-weight, malnutrition, constipation, abdominal pain, colic; anemia; gingival lead line; tremors, paralysis wrists and ankles; encephalopathy; kidney disease; irritation eyes; hypotension.
Polycyclic Aromatic Hydrocarbons (PAHs)	PEL = 5 mg/m^3	Harmful effects to skin, bodily fluids, and ability to fight disease, reproductive problems; [potential occupational carcinogen].
Tetrachloroethylene (PCE)	PEL = 100 ppm STEL = 200 ppm	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, poor coordination; headache, drowsiness; skin erythema (skin redness); liver damage; potential occupational carcinogen.
Toluene	REL = 100 ppm PEL = 200 ppm STEL = 300 ppm	Irritation eyes, nose; lassitude, confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage.

Chemicals	REL/PEL/STEL	Health Hazards
Xylenes	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, poor coordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis.
Comments: REL = National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit PEL = OSHA Permissible Exposure Limit STEL = OSHA Short Term Exposure Limit		

The Safety Data Sheets (SDSs) for these known and suspected on-site contaminants are provided in HASP Attachment B.

2.2 Designated Personnel

AKRF will appoint one of its on-site personnel as the Site Safety Officer (SSO). This individual will be responsible for the implementation of the HASP. The SSO will work under the direction of a Qualified Environmental Professional (QEP) and will be experienced in the implementation of air monitoring and hazardous materials sampling programs. Health and safety training required for the SSO and all field personnel are outlined in Section 2.3 of this HASP.

2.3 Training

All personnel who enter the work area while intrusive activities are being performed will have completed a 30-hour and 40-hour training course that meets OSHA requirements of 29 CFR Part 1910, Occupational Safety and Health Standards. In addition, all personnel will have up to date 8-hour refresher training. The training will allow personnel to recognize and understand the potential hazards to health and safety. All field personnel must attend a training program, whose purpose is to:

- Make them aware of the potential hazards they may encounter;
- Provide the knowledge and skills necessary for them to perform the work with minimal risk to health and safety;
- Make them aware of the purpose and limitations of safety equipment; and
- Ensure that they can safely avoid or escape from emergencies.

Each member of the field crew will be instructed in these objectives before work begins. A Site safety meeting will be conducted at the start of the project work. Additional meetings shall be conducted, as necessary, for new personnel working at the Site and for any new hazards that may become present as work progresses.

2.4 Medical Surveillance Program

All personnel performing field work involving subsurface disturbance at the Site with the potential of encountering contaminated media are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120 (f). A physician's medical release for work will be confirmed by the SSO before an employee can begin Site activities. The medical release shall consider the type of work to be performed and the required personal protective equipment (PPE). The medical examination will, at a minimum, be provided annually and upon termination of hazardous waste Site work.

2.5 Site Work Zones

During any activities involving subsurface disturbance, the work area must be divided into various zones to prevent the spread of any contamination, ensure that proper PPE is donned, and provide an area for decontamination.

The Exclusion Zone is defined as the area where exposure to impacted media could be encountered. The Contamination Reduction Zone (CRZ) is the area where decontamination procedures take place and is located next to the Exclusion Zone. The Support is the zone area where support facilities such as vehicles, fire extinguisher, and first aid supplies are located. The emergency staging area (part of the Support Zone) is the area where all workers on-site would assemble in the event of an emergency. These zones may be changed by the SSO, depending on that day's activities. All field personnel will be informed of the location of these zones before work begins. Control measures such as caution tape and/or traffic cones will be placed around the perimeter of the work area when needed.

2.6 Community Air Monitoring Plan (CAMP)

The purpose of the CAMP is to identify any exposure of the community to potential environmental hazards in the soil and groundwater. Community air monitoring will be conducted during all intrusive Site activities in compliance with the New York State Department of Health (NYSDOH) Generic CAMP. Results of the air monitoring will be used to determine the appropriate response action, if needed. Field personnel will be trained in the proper operation of all field instruments at the start of the program. The equipment will be calibrated according to manufacturer specifications at the start of each day of fieldwork. If an instrument fails calibration, the project manager will be contacted immediately to obtain a replacement instrument and arrange for repairs. Real-time air monitoring for volatile compounds and particulates at the perimeter of the exclusion zone will be performed as described below.

CAMP summary reports will be prepared and submitted to NYSDEC and NYSDOH for review on weekly basis. In the event there is an action level exceedance or complaint, NYSDEC and NYSDOH will be notified within 24 hours (same day to the extent possible) of the exceedance or complaint. The notification will include a description of the exceedance or complaint, the cause of the exceedance, and any corrective actions taken. All recorded CAMP data will be included in monthly progress reports and a future Final Engineering Report (FER).

2.6.1 Volatile Organic Compound (VOC) Monitoring

Continuous monitoring for VOCs will be conducted during all ground intrusive activities, including excavation and drilling activities associated with the development work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background concentrations. VOCs will be monitored continuously at the downwind perimeter of the exclusion zone. Monitoring will be conducted with a photoionization detector (PID) equipped with a 10.6 eV lamp capable of calculating 15-minute running average concentrations and equipped with an audible alarm to indicate exceedances of action levels. An inspection of the monitoring stations will be conducted on at least an hourly basis. All 15-minute average PID readings will be recorded and available for NYSDEC and NYSDOH personnel to review. The action levels and their respective required responses are summarized in Table 1.

2.6.2 Airborne Particulate Monitoring

Continuous monitoring for particulates will be conducted during all ground intrusive activities, which will involve the measurement of respirable dust. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background concentrations. Particulates will be monitored continuously at the downwind perimeter of the exclusion zone. Community air monitoring for dust particulates will be conducted using a DustTrak® or equivalent to measure the concentration of airborne respirable particulates less than 10 micrometers in size (PM_{10}). The dust monitor will be capable of calculating 15-minute running average concentrations and equipped with an audible alarm to indicate exceedance of action levels. An inspection of the monitoring stations will be conducted on at least an hourly basis. All 15-minute average readings will be recorded and available for NYSDEC and NYSDOH personnel to review. The action levels and their respective required responses are summarized in Table 1.

Table 1
CAMP Action Levels and Required Responses

Monitoring	Action Level[1]	Response Action
Particulates	15-minute average between 0.100 mg/m^3 and 0.150 mg/m^3 above background	Implement dust suppression measures and continue monitoring. Work may continue if levels remain below 0.150 mg/m^3 and no visible dust is migrating from the work area.
	15-minute average greater than 0.150 mg/m^3 above background	Stop work until dust suppression measures mitigate levels to below 0.150 mg/m^3.
Volatile Organic Compound (VOC)	15-minute average between 5 and 25 ppm	Stop work, identify source of vapors, and mitigate. Work may continue if instantons readings rapidly decrease below 5ppm above background.
	15-minute average more than 25 ppm	Shutdown of work. Mitigate levels to below 5 ppm.

Notes:
[1] - 15-minute time-weighted average
parts per million = ppm
milligrams per cubic meter = mg/m^3

2.6.3 Odor Emission Monitoring

In the event nuisance odors are identified during ground intrusive activities within the exclusion zone, frequent monitoring for nuisance odors will be conducted (30-minute intervals) 200 feet downwind, or at the nearest Site perimeter, whichever is less of a distance from the exclusion zone. In the event nuisance odors are identified, all work activities must be halted until adjustment to work practices and/or odor suppression measures are implemented to eliminate the nuisance condition.

Nuisance odors, if observed by nearby community members, can be reported to the NYSDEC Project Manager and/or the NYSDOH Public Health Specialist. Contact information is provided in Section 3.2.

2.7 Work Zone Air Monitoring

Real time air monitoring of VOCs and particulates will be performed in the work zone during all intrusive Site activities. Work zone air monitoring for VOCs will be performed with a PID. The PID will be calibrated with 100 parts per million (ppm) isobutylene standard gas in accordance with the manufacturer's instructions at the start of each workday. Work zone air monitoring for particulates will be conducted using a MIE 1000 Personal DataRam or equivalent to measure the concentration of airborne respirable particulates less than 10 micrometers in size (PM_{10}).

The SSO shall set up the equipment and confirm that it is working properly. His/her designee may oversee the air measurements during the day. Measurements will be taken prior to commencement of work and continuously during the work. Measurements will be made as close to the workers as practicable and at the breathing height of the workers. The action levels and required personal protective equipment (PPE) responses are summarized in Table 2.

Table 2
Work Zone Action Levels and Required PPE Responses

Instrument	Action Level	Response Action
PID	Less than 5 ppm in breathing zone	Level D or D-Modified
	Between 5 ppm and 10 ppm	Level C
	More than 10 ppm	Stop work. Resume work when readings are less than 5 ppm
Particulate Monitor (MIE 1000 Personal DataRam™ or equivalent)	Less than 1.25 µg/m^3 above background in breathing zone	Level D or D-Modified
	More than 1.25 µg/m^3 above background in breathing zone	Stop work. Resume work when readings are less than 1.25 µg/m^3.
Notes: µg/m^3 = micrograms per cubic meter; ppm = parts per million		

2.8 Personal Protective Equipment (PPE)

The PPE required for various kinds of investigation tasks are based on 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, Appendix B, "General Description and Discussion of the Levels of Protection and Protective Gear."

AKRF field personnel and other site personnel shall wear, at a minimum, Level D PPE. The protection will be based on the air monitoring described in Section 2.7.

Level D PPE includes donning of the following during drilling and sampling:

- Steel or Composite Toed Boots
- Hard Hat
- Work Gloves
- Safety Glasses
- Ear Plugs
- Nitrile Gloves
- Tyvek Suit [if non-aqueous phase liquid (NAPL) is present]

If required by the action levels, personnel will don Level C PPE, which includes Level D PPE and a half- or full-face respirator with a dual organic and particulate cartridge.

2.9 General Work Practices

To protect the health and safety of the field personnel, field personnel will adhere to the guidelines listed below during activities involving subsurface disturbance:

- Eating, drinking, chewing gum or tobacco, and smoking or vaping are prohibited, except in designated areas on the Site. These areas will be designated by the SSO.
- Workers must wash their hands thoroughly on leaving the work area and before eating, drinking, or any other such activity.

- The workers should shower as soon as possible after leaving the Site. Contact with contaminated or suspected surfaces should be avoided.
- The buddy system should always be used; each buddy should watch for signs of fatigue, exposure, and heat/cold stress.
- Up-to-date CDC protocols should be adhered to for infectious disease protection (e.g., donning face masks, regularly washing hands, etc.). See HASP Attachment A for more details.

3.0 EMERGENCY PROCEDURES AND EMERGENCY RESPONSE PLAN

The field crew will be equipped with emergency equipment, such as a first aid kit and disposable eye washes. In the case of a medical emergency, the SSO will determine the nature of the emergency and he/she will have someone call for an ambulance, if needed. If the nature of the injury is not serious, i.e., the person can be moved without expert emergency medical personnel, he/she should be taken to a hospital by on-site personnel. Directions to the hospital are provided below, and a Hospital Location Map showing the more direct route to the hospital is included as Figure 2.

3.1 Hospital Information

Hospital Name:	Saint Joseph's Emergency Medical Center
Phone Number:	(914) 378-7000
Address:	127 South Broadway, Yonkers, NY 10701
Directions:	1. Head SOUTH (turn RIGHT) on Alexander Street toward Babcock Place 2. Head EAST (turn LEFT) on Babcock Place toward Warburton 3. Head SOUTH (turn RIGHT) on Warburton toward Main Street 4. Continue onto NY State Reference Route 984H/Riverdale Avenue 5. Turn LEFT onto Prospect Street 6. Turn RIGHT onto South Broadway 7. Emergency room will be on the RIGHT

3.2 Emergency Contacts

Company	Individual Name	Title	Contact Number
AKRF	Marc Godick	Project Director	(914) 922-2356
	Scott Caporizzo	Project Manager	(914) 922-2354
	Stephen Schmid	Field Team Leader / Site Safety Officer	(914) 400-9736 (cell)
	John Sulich	Site Safety Officer Alternate	(203) 517-7433 (cell)
Extell Hudson Waterfront LLC	Ryan Masters	Owner's Representative	(646) 218-4215
Ambulance, Fire Department & Police Department	-	-	911
New York State Department of Environmental Conservation	Kimberly Junkins	Project Manager	(845) 633-5457
New York State Department of Health	Eamonn O'Neil	Public Health Specialist	(518) 402-7860
NYSDEC Spill Hotline	-	-	800-457-7362

4.0 APPROVAL & ACKNOWLEDGMENTS OF HASP

4.1 Approval

Signed: _____ Date: _____

AKRF Project Manager

Signed: _____ Date: _____

AKRF Health and Safety Officer

Below is an affidavit that must be signed by all workers who enter the site. A copy of the HASP must be on-site at all times and will be kept by the SSO.

4.2 Affidavit

I have read the Health and Safety Plan (HASP) for the project located at 25, 35 and 45 Riverside Drive (f/k/a Alexander Street) in Yonkers, New York. I agree to conduct all on-site work in accordance with the requirements set forth in this HASP and understand that failure to comply with this HASP could lead to my removal from the site.

Signed: _____ Company: _____ Date: _____
Signed: _____ Company: _____ Date: _____
Signed: _____ Company: _____ Date: _____
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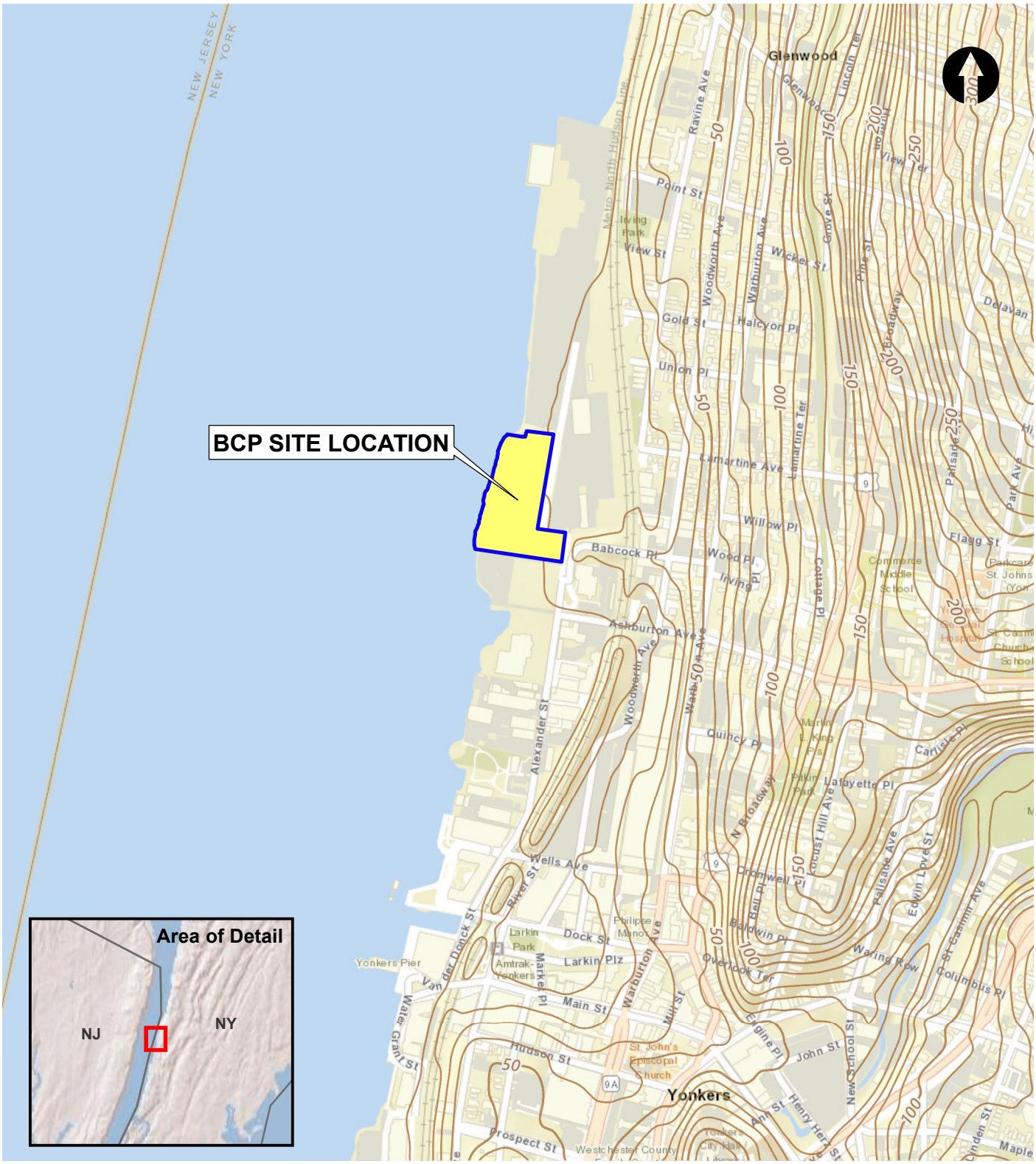
HASP FIGURES



Service Layer Credits: ESRI Worlwide Street Map data; 2019.

Map Source - BCP Site Boundary from Paulus, Sokolowski and Sartor Architecture & Engineering, P.C. Figure 1B, Drawing Titled "Groundwater Applicable SCG Exceedances" - dated April 16, 2019.

0 800 1,600

SCALE IN FEET

AKRF
440 Park Avenue South, New York, NY 10016

EXTELL FORMER EXCELSIOR BAG

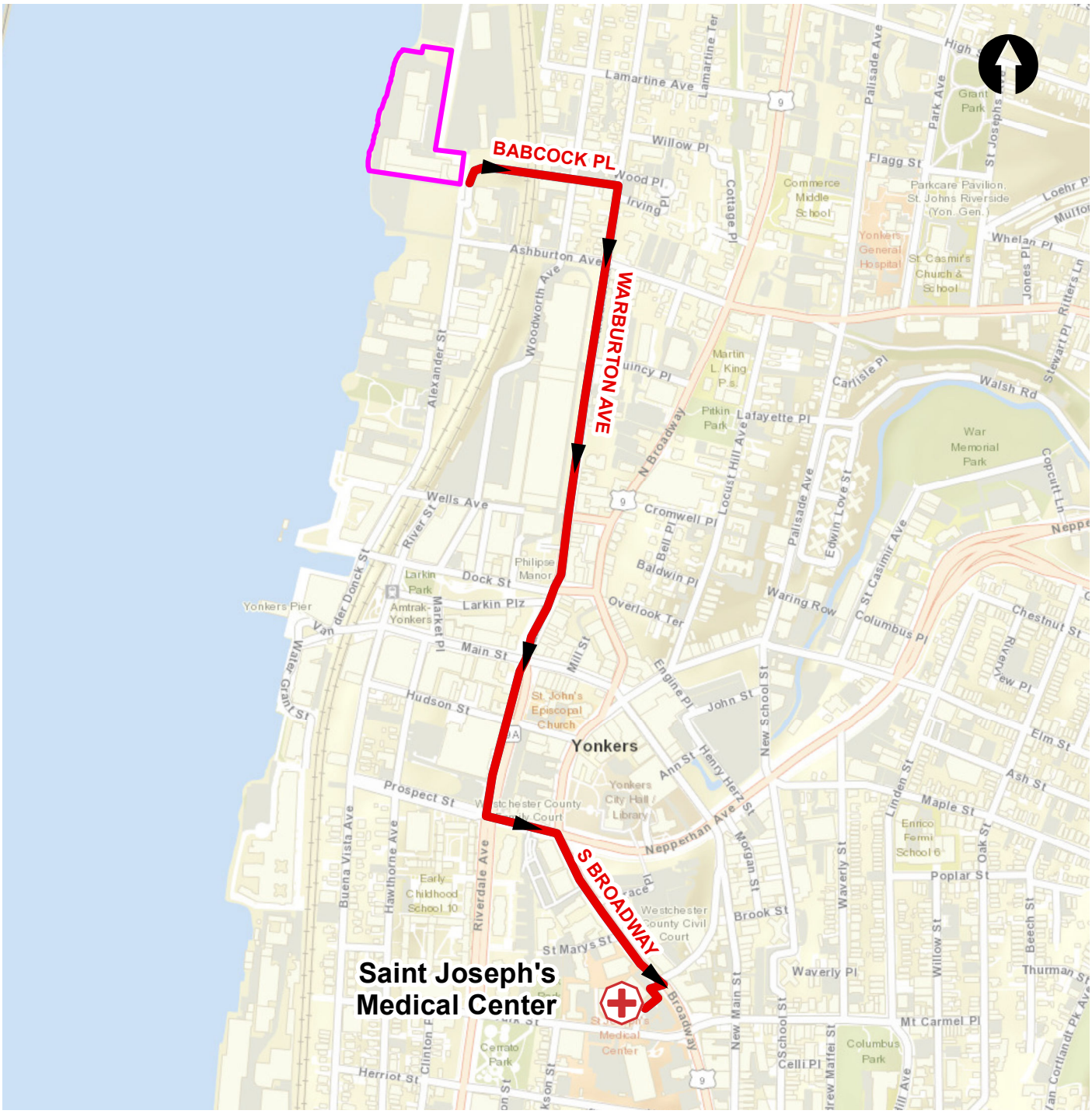
Yonkers, New York

SITE LOCATION MAP

DATE 4/7/2020

PROJECT NO. 200131

FIGURE 1



Service Layer Credits: ESRI World Street Map 2020

LEGEND

- BCP SITE BOUNDARY
- ROUTE TO HOSPTIAL
- HOSPITAL LOCATION

Saint Joseph's Medical Center
127 S. Broadway
Yonkers, NY 10701
(914) 378-7000

0 800 1,600
SCALE IN FEET

AKRF
440 Park Avenue South, New York, NY 10016

EXTELL FORMER EXCELSIOR BAG
Yonkers, New York

HOSPITAL ROUTE MAP

DATE
4/7/2020

PROJECT NO.
200131

FIGURE
2

HASP ATTACHMENT A

SUPPLEMENTAL REQUIREMENTS FOR COVID-19

ON-SITE AND OFF-SITE PROCEDURES TO LIMIT CONTAMINATION AND POTENTIAL SPREAD OF COVID-19

Sources: **CDC - COVID-19 Spread and Prevention Information; OSHA - Workplace Preparation Guidance; CDC - Guidance on Extended Use/Limited Reuse of Respiratory Protection**

1) Maintain minimum 6-foot separation from others whenever possible (social distancing). The virus is thought to spread mainly from person-to-person, between people who are in close contact, through respiratory droplets produced when an infected person coughs or sneezes.

2) Wash your hands frequently with soap and water. Wash for at least 20 seconds and, if no soap is present, use a hand sanitizer that contains at least 60% alcohol.

3) Wear nitrile gloves whenever possible and be especially mindful of touching common surfaces.

4) Disinfect commonly touched surfaces frequently, and items frequently used in public immediately upon returning home.

5) Face Coverings and Masks:

   a) On-site: Wear a face covering or mask at all times when social distancing cannot be maintained. N95/KN95 masks or respirators should be reserved for situations where social distancing on-site is difficult or impossible for extended periods of time.

   b) Off-site During Work-related Commute: The CDC recommends wearing face coverings in public settings where other social distancing measures are difficult to maintain (https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover-guidance.html). A face covering should be worn during your commute to and from the site if you are unable to achieve proper social distancing. Appropriate times to wear a mask or cloth face covering include, but are not necessarily limited to, taking mass transit, walking on crowded sidewalks, traveling in a shared vehicle, and/or if you are required to enter an occupied indoor space to acquire supplies for the site.

6) Wear safety glasses or goggles at all times while on-site and some form of eye covering (e.g., sunglasses, prescription and non-prescription glasses, or safety glasses) should be considered when commuting.

7) Avoid touching your face (eyes, nose, and mouth).

8) Cover your nose and mouth when coughing, sneezing, etc./ cough into elbow.

9) Do not spit.

10) Try to take your temperature regularly.

11) Talk to your supervisor if you, your friends, or family members that you live with or spend time with have displayed symptoms of COVID-19, tested positive, or are afflicted with even the common cold/flu.

12) Talk to your supervisor if anyone you know at the site tested positive for the COVID-19.

13) Follow any additional health & safety protocols required at the site or elsewhere.

HASP ATTACHMENT B

POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS

(SAFETY DATA SHEETS)

SAFETY DATA SHEET

Version 6.1
Revision Date 01/15/2020
Print Date 05/29/2020

SECTION 1: Identification of the substance/mixture and of the company/undertaking

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 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 3), H331
Carcinogenicity (Category 1B), 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)

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

SECTION 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

Component	Classification	Concentration
Arsenic		
	Acute Tox. 4; Acute Tox. 3; Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H302, H331, H350, 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. 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
Arsenic 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 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.

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

SECTION 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/m3	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/m3	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
Arsenic	7440-38-2	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: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.

SECTION 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 (1503 °F) - lit.
f)	Initial boiling point and boiling range	613 °C 1135 °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

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 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
In the event of fire: see section 5

SECTION 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:	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
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

SECTION 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.

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: 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

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
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
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Arsenic	7440-38-2	2015-11-23

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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: 01/15/2020 Print Date: 05/29/2020

SAFETY DATA SHEET

Version 6.1
Revision Date 10/05/2019
Print Date 05/29/2020

SECTION 1: Identification of the substance/mixture and of the company/undertaking

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

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 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), Blood, H372
Aspiration hazard (Category 1), H304
Short-term (acute) aquatic hazard (Category 2), H401
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	
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 (Blood) through prolonged or repeated exposure.
H401	Toxic to aquatic life.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	C_6H_6
Molecular weight	:	78.11 g/mol
CAS-No.	:	71-43-2
EC-No.	:	200-753-7
Index-No.	:	601-020-00-8

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 2; Aquatic Chronic 3; H225, H315, H319, H340, H350, H372, H304, H401, 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. 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

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.
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): 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
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		

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 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.

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 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 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	80.1 °C 176.2 °F at 1,013 hPa
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: 8.0 %(V) Lower explosion limit: 1.4 %(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/cm3
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) - Bioaccumulation is not expected.
p)	Auto-ignition temperature	498 °C (928 °F) at 1,013.5 hPa
q)	Decomposition temperature	No data available
r)	Viscosity	0.78 mm2/s at 20 °C (68 °F) -
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
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

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male - > 2,000 mg/kg
(OECD Test Guideline 401)
LD50 Oral - Rat - male - 5,970 mg/kg
(OECD Test Guideline 401)
LC50 Inhalation - Rat - female - 4 h - 43.7 mg/l
(OECD Test Guideline 403)
LD50 Dermal - Rabbit - male and female - > 8,260 mg/kg
(OECD Test Guideline 402)
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation - 4 h
(OECD Test Guideline 404)
Drying-out effect resulting in rough and chapped skin.

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation
Remarks: (ECHA)

Respiratory or skin sensitisation
Maximisation Test - Guinea pig
Result: Does not cause skin sensitisation.
(OECD Test Guideline 406)

Germ cell mutagenicity
May cause genetic defects.
Ames test
Salmonella typhimurium
Result: negative
In vitro mammalian cell gene mutation test
Result: negative
(ECHA)
Mutagenicity (mammal cell test): chromosome aberration.
Chinese hamster lung cells
Result: positive
OECD Test Guideline 474

Mouse - male - Bone marrow
Result: positive

Carcinogenicity
May cause cancer. Positive evidence from human epidemiological 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

Specific target organ toxicity - single exposure
No data available
Acute oral toxicity - Nausea
Acute inhalation toxicity - Possible damages:, mucosal irritations

Specific target organ toxicity - repeated exposure
Causes damage to organs through prolonged or repeated exposure. - Blood

Aspiration hazard
May be fatal if swallowed and enters airways.
Aspiration hazard, Aspiration may cause pulmonary oedema and pneumonitis.

Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 120 d - No observed adverse effect level - 100 mg/kg - Lowest observed adverse effect level - 25 mg/kg
Subchronic toxicity
RTECS: CY1400000

Nausea, Dizziness, Headache, narcosis, Inhalation of high concentrations of benzene may have an initial stimulatory effect on the central nervous system characterized by exhilaration, nervous excitation and/or giddiness, depression, drowsiness, or fatigue. The victim may experience tightness in the chest, breathlessness, and loss of consciousness. Tremors, convulsions, and death due to respiratory paralysis or circulatory collapse can occur in a few minutes to several hours following severe exposures. Aspiration of small amounts of liquid immediately causes pulmonary edema and hemorrhage of pulmonary tissue. Direct skin contact may cause erythema. Repeated or prolonged skin contact may result in drying, scaling dermatitis, or development of secondary skin infections. The chief target organ is the hematopoietic system. Bleeding from the nose, gums, or mucous membranes and the development of purpuric spots, pancytopenia, leukopenia, thrombocytopenia, aplastic anemia, and leukemia may occur as the condition progresses. The bone marrow may appear normal, aplastic or hyperplastic, and may not correlate with peripheral blood-forming tissues. The onset of effects of prolonged benzene exposure may be delayed for many months or years after the actual exposure has ceased., Blood disorders
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

agitation, Headache, Dizziness, inebriation, Tiredness, CNS disorders, narcosis, respiratory arrest

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Oncorhynchus mykiss (rainbow trout) - 5.3 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 10 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	static test EC50 - Pseudokirchneriella subcapitata (green algae) - 100 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test IC50 - - 13 mg/l - 24 h Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: 96 % - Readily biodegradable. (OECD Test Guideline 301F)
Theoretical oxygen demand	3,100 mg/g Remarks: (Lit.)
Ratio BOD/ThBOD	71 % Remarks: (Lit.)
Ratio BOD/ThBOD	80 % Remarks: (Lit.)

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

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.
Endangers drinking-water supplies if allowed to enter soil or water.
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. 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.

SECTION 14: Transport information

DOT (US)
UN number: 1114 Class: 3 Packing group: II
Proper shipping name: Benzene
Reportable Quantity (RQ): 10 lbs
Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1114 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: BENZENE

IATA
UN number: 1114 Class: 3 Packing group: II
Proper shipping name: Benzene

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
Benzene	71-43-2	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Reportable Quantity : D018 lbs

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
Benzene		

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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: 10/05/2019 Print Date: 05/29/2020

SAFETY DATA SHEET

Version 6.1
Revision Date 01/15/2020
Print Date 05/29/2020

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Ethylbenzene

Product Number : 296848
Brand : Sigma-Aldrich
Index-No. : 601-023-00-4
CAS-No. : 100-41-4

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)

Flammable liquids (Category 2), H225
Acute toxicity, Inhalation (Category 4), H332
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure (Category 2), H373
Aspiration hazard (Category 1), H304
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)

H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H332	Harmful if inhaled.
H351	Suspected of causing cancer.
H373	May cause damage to 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.
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): 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.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P331	Do NOT induce vomiting.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	C_8H_{10}
Molecular weight	:	106.17 g/mol
CAS-No.	:	100-41-4
EC-No.	:	202-849-4
Index-No.	:	601-023-00-4

Component	Classification	Concentration
Ethylbenzene		
	Flam. Liq. 2; Acute Tox. 4;	<= 100 %

	Carc. 2; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; H225, H332, H351, H373, H304, H401	

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
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, soak up with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and transfer to a 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.
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.

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Ethylbenzene	100-41-4	TWA	100 ppm 435 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	The value in mg/m3 is approximate.		

		PEL	5 ppm 22 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	30 ppm 130 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
Ethylbenzene	100-41-4	Sum of mandelic acid and phenyl glyoxylic acid	0.15g/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: 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, 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 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: -95 °C (-139 °F) - lit.
f)	Initial boiling point and boiling range	136 °C 277 °F - lit.
g)	Flash point	15.0 °C (59.0 °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: 6.7 %(V) Lower explosion limit: 1 %(V)
k)	Vapour pressure	13.3 hPa at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	0.867 g/cm3 at 25 °C (77 °F)
n)	Water solubility	0.2 g/l at 25 °C (77 °F) - slightly soluble
o)	Partition coefficient: n-octanol/water	log Pow: 3.6 at 20 °C (68 °F)
p)	Auto-ignition temperature	432.0 °C (809.6 °F)
q)	Decomposition	No data available

temperature

r)	Viscosity	0.773 mm2/s at 20 °C (68 °F) -
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Surface tension	71.2 mN/m at 23 °C (73 °F)

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
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

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 3,500 mg/kg
Inhalation: No data available
LD50 Dermal - Rabbit - 15,433 mg/kg
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Moderate skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
Hamster

ovary
Result: negative

Mouse - male and female
Result: negative

Carcinogenicity

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Ethylbenzene)

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
May be fatal if swallowed and enters airways.

Additional Information

Repeated dose toxicity - Rat - male and female - No observed adverse effect level - 75 mg/kg
RTECS: DA0700000

Central nervous system depression, Nausea, Headache, Vomiting, Ataxia., Tremors

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 4.2 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 1.8 - 2.4 mg/l - 48 h
Toxicity to algae	static test EC50 - Skeletonema costatum (marine diatom) - 4.9 mg/l - 72 h

12.2 Persistence and degradability

Biodegradability: aerobic - Exposure time 28 d
Result: 70 - 80 % - Readily biodegradable.

12.3 Bioaccumulative potential

Due to the distribution coefficient n-octanol/water, accumulation in organisms is not expected.

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.

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: 1175 Class: 3 Packing group: II
Proper shipping name: Ethylbenzene
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1175 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ETHYLBENZENE

IATA
UN number: 1175 Class: 3 Packing group: II
Proper shipping name: Ethylbenzene

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
Ethylbenzene	100-41-4	2007-07-01

SARA 311/312 Hazards
Fire 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
Ethylbenzene	100-41-4	2007-07-01

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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: 01/15/2020 Print Date: 05/29/2020

SAFETY DATA SHEET

Version 6.3
Revision Date 04/13/2020
Print Date 06/02/2020

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Diesel Fuel No. 2

Product Number : UST148
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

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), Central nervous system, H336
Specific target organ toxicity - repeated exposure (Category 2), thymus, Liver, Bone marrow, H373
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

Signal word Warning

Hazard statement(s)
H315 Causes skin irritation.

H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.
H373	May cause damage to organs (thymus, Liver, Bone marrow) 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.
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/ 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.
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

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Component		Classification	Concentration
Methylene chloride			
CAS-No. EC-No. Index-No.	75-09-2 200-838-9 602-004-00-3	Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; STOT SE 3; H315, H319, H351, H336 Concentration limits: 20 %: STOT SE 3, H336;	>= 90 - <= 100 %
Fuels, diesel, no. 2			
CAS-No. EC-No. Index-No.	68476-34-6 270-676-1 649-227-00-2	Flam. Liq. 3; Acute Tox. 4; Skin Irrit. 2; Carc. 2; STOT RE 2; Asp. Tox. 1; Aquatic Chronic 2; H226, H332, H315, H351, H373, H304, H411	>= 5 - < 10 %

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, Hydrogen chloride gas
No data available
Combustible.

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. 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.

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 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
Methylene chloride	75-09-2	TWA	50 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Carboxyhemoglobinemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		Substance listed; for more information see OSHA document 1910.1052		
		Potential Occupational Carcinogen See Appendix A		
		PEL	25 ppm	OSHA Specifically Regulated Chemicals/Carcinogens
		1910.1052 This section applies to all occupational exposures to methylene chloride (MC), Chemical Abstracts Service Registry Number 75-09-2, in general industry, construction		

		and shipyard employment. Methylene chloride (MC) means an organic compound with chemical formula, CH2Cl2. Its Chemical Abstracts Service Registry Number is 75-09-2. Its molecular weight is 84.9 g/mole OSHA specifically regulated carcinogen		
		STEL	125 ppm	OSHA Specifically Regulated Chemicals/Carcinogens
		1910.1052 This section applies to all occupational exposures to methylene chloride (MC), Chemical Abstracts Service Registry Number 75-09-2, in general industry, construction and shipyard employment. Methylene chloride (MC) means an organic compound with chemical formula, CH2Cl2. Its Chemical Abstracts Service Registry Number is 75-09-2. Its molecular weight is 84.9 g/mole OSHA specifically regulated carcinogen		
		See Table Z-2		
		STEL	125 ppm 435 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		see section 5202		
		PEL	25 ppm 87 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		see section 5202		
Fuels, diesel, no. 2	68476-34-6	TWA	100 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Dermatitis Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption varies		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Methylene chloride	75-09-2	Dichloromethane	0.3 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
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. 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	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
Hazardous decomposition products formed under fire conditions. - 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

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: 2A - Group 2A: Probably carcinogenic to humans (Methylene chloride)

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.

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
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful 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. 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: 1593 Class: 6.1 Packing group: III
Proper shipping name: DichloromethaneSOLUTION

Reportable Quantity (RQ): 1052 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1593 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: DICHLOROMETHANESOLUTION

IATA
UN number: 1593 Class: 6.1 Packing group: III
Proper shipping name: DichloromethaneSOLUTION

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
Dichloromethane	75-09-2	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.

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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: 6.3 Revision Date: 04/13/2020 Print Date: 06/02/2020

SAFETY DATA SHEET

Version 6.1
Revision Date 01/15/2020
Print Date 05/23/2020

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Kerosene

Product Number : 60710
Brand : SIGALD
Index-No. : 649-404-00-4
CAS-No. : 8008-20-6

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

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 4), H227
Skin irritation (Category 2), H315
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Aspiration hazard (Category 1), H304
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 Danger

Hazard statement(s)

H227	Combustible liquid.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
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.
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.
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.
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.
P391	Collect spillage.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

CAS-No. : 8008-20-6
EC-No. : 232-366-4
Index-No. : 649-404-00-4

Component	Classification	Concentration
Kerosine		
	Flam. Liq. 4; Skin Irrit. 2; STOT SE 3; Asp. Tox. 1; Aquatic Chronic 2; H227, H315, H336, H304, 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.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

SECTION 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
Nature of decomposition products not known.

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). 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.
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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Kerosine	8008-20-6	TWA	200 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Upper Respiratory Tract irritation Skin irritation Application restricted to conditions in which there are neglible aerosol exposures Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption varies		
		TWA	100 mg/m3	USA. NIOSH Recommended Exposure Limits
		A refined petroleum solvent (predominantly C9-C16), which typically is 25% normal paraffins, 11% branched paraffins, 30% monocycloparaffins, 12% dicycloparaffins, 1% tricycloparaffins, 16% mononuclear aromatics & 5% dinuclear aromatics.		

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: 0.4 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: 32 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.

SECTION 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	No data available
f)	Initial boiling point and boiling range	190 - 250 °C 374 - 482 °F
g)	Flash point	70 °C (158 °F)
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 5 %(V) Lower explosion limit: 0.7 %(V)
k)	Vapour pressure	0.31 hPa at 20 °C (68 °F)
l)	Vapour density	No data available
m)	Relative density	0.8 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

Surface tension	32 mN/m at 20 °C (68 °F)

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, Strong bases, Strong acids, Amines

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
LD50 Oral - Rabbit - 2,835 mg/kg
Remarks: Behavioral:Muscle weakness. Lungs, Thorax, or Respiration:Respiratory stimulation. Endocrine:Hypoglycemia.
Inhalation: No data available
Dermal: 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
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
Inhalation - May cause drowsiness or dizziness. - Central nervous system

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
May be fatal if swallowed and enters airways.

Additional Information
RTECS: OA5500000

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
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

SECTION 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. This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
NA-Number: 1993 Class: NONE Packing group: III
Proper shipping name: Combustible liquid, n.o.s.
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 1223 Class: 3 Packing group: III EMS-No: F-E, S-E
Proper shipping name: KEROSENE
Marine pollutant : yes

IATA
UN number: 1223 Class: 3 Packing group: III
Proper shipping name: Kerosene

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
Fire Hazard, 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
Kerosine	8008-20-6	2007-03-01

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.1 Revision Date: 01/15/2020 Print Date: 05/23/2020

SAFETY DATA SHEET

Version 8.1
Revision Date 03/28/2020
Print Date 06/02/2020

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : No. 1 Fuel Oil

Product Number : 47518-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 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 2), H225
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), 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)
H225 Highly flammable liquid and vapour.
H301 + H311 + H331 Toxic if swallowed, in contact with skin or if inhaled.
H370 Causes damage to organs.

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.
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 + 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

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Component		Classification	Concentration
Methanol			
CAS-No. EC-No. Index-No. Registration number	67-56-1 200-659-6 603-001-00-X 01-2119433307-44-XXXX	Flam. Liq. 2; Acute Tox. 3; STOT SE 1; H225, H301, H331, H311, H370	>= 90 - <= 100 %
Fuel oil, no. 1			
CAS-No.	70892-10-3	Flam. Liq. 3; Acute Tox. 2; H226, H300	>= 1 - < 5 %

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
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
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.

SECTION 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.

Store at room temperature.
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/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.		
		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 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.

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.

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	9.7 °C (49.5 °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	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
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
Acid chlorides, Acid anhydrides, Oxidizing agents, Alkali metals, Reducing agents, 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

SECTION 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.

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

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.
Effects due to ingestion may include:, Headache, Dizziness, Drowsiness, metabolic acidosis, Coma, Seizures.
Symptoms may be delayed., Damage of the:, Liver, Kidney

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
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: 1230 Class: 3 Packing group: II
Proper shipping name: MethanolSOLUTION

Reportable Quantity (RQ):
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: MethanolSOLUTION

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
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Methanol	67-56-1	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

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
Fuel oil, no. 1	70892-10-3	

California Prop. 65 Components

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.Methanol	CAS-No. 67-56-1	Revision Date 2012-03-16

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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: 8.1 Revision Date: 03/28/2020 Print Date: 06/02/2020

SAFETY DATA SHEET

Version 8.1
Revision Date 03/28/2020
Print Date 06/02/2020

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : No. 2 Fuel Oil

Product Number : 47515-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 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 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

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.

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.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
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.
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

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Molecular weight : 32.04 g/mol

Component		Classification	Concentration
Methanol			
CAS-No. EC-No. Index-No. Registration number	67-56-1 200-659-6 603-001-00-X 01-2119433307-44-XXXX	Flam. Liq. 2; Acute Tox. 3; STOT SE 1; H225, H301, H331, H311, H370	>= 90 - <= 100 %
Fuel oil no. 2			
CAS-No. EC-No.	68476-30-2 270-671-4	Carc. 2; H351	>= 1 - < 5 %

Index-No.	649-225-00-1		

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
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
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.

SECTION 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.

Store at room temperature.
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/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.		
		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		
Fuel oil no. 2	68476-30-2	TWA	100 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Dermatitis Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption varies		

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.

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 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	pungent
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -98.0 °C (-144.4 °F)
f)	Initial boiling point and boiling range	64.0 - 65.0 °C 147.2 - 149.0 °F at 1013 hPa
g)	Flash point	9.7 °C (49.5 °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: 36 %(V) Lower explosion limit: 6 %(V)
k)	Vapour pressure	130.3 hPa at 20.0 °C (68.0 °F) 546.6 hPa at 50.0 °C(122.0 °F) 169.27 hPa at 25.0 °C(77.0 °F)

l)	Vapour density	1.11
m)	Relative density	0.79 g/cm3 at 20 °C (68 °F)
n)	Water solubility	completely miscible
o)	Partition coefficient: n-octanol/water	log Pow: -0.77
p)	Auto-ignition temperature	455.0 °C (851.0 °F) at 1,013 hPa
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	Not explosive
t)	Oxidizing properties	The substance or mixture is not classified as oxidizing.

9.2 Other safety information

Minimum ignition energy	0.14 mJ
Conductivity	< 1 µS/cm
Relative vapour density	1.11

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
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks.
Heat, flames and sparks.

10.5 Incompatible materials
Acid chlorides, Acid anhydrides, Oxidizing agents, Alkali metals, Reducing agents, 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

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.
Effects due to ingestion may include:, Headache, Dizziness, Drowsiness, metabolic acidosis, Coma, Seizures.
Symptoms may be delayed., Damage of the:, Liver, Kidney

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
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: 1230 Class: 3 Packing group: II
Proper shipping name: MethanolSOLUTION

Reportable Quantity (RQ): 5000 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: MethanolSOLUTION

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
Fire Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01
Fuel oil no. 2	68476-30-2	2010-08-02

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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: 8.1 Revision Date: 03/28/2020 Print Date: 06/02/2020

SAFETY DATA SHEET

Version 6.1
Revision Date 01/15/2020
Print Date 05/29/2020

SECTION 1: Identification of the substance/mixture and of the company/undertaking

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 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
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - repeated exposure (Category 2), H373
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)

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

SECTION 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

Component	Classification	Concentration
Lead		
	Acute Tox. 4; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H302, H351, H372, 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
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

Lead 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.

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
	Remarks	See 1910.1025		
Lead	7439-92-1	TWA	0.05 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Confirmed animal carcinogen with unknown relevance to humans		
		TWA	0.05 mg/m3	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/m3	USA. NIOSH Recommended Exposure Limits
		See Appendix C		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Lead	7439-92-1	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.

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: 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

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

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

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

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
May damage fertility. May damage the unborn child.

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
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	mortality LOEC - Oncorhynchus mykiss (rainbow trout) - 1.19 mg/l - 96.0 h
	LC50 - Micropterus dolomieui - 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(Lead)

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.

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. (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.

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
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

Lead	CAS-No. 7439-92-1	Revision Date 2015-11-23

New Jersey Right To Know Components

Lead	CAS-No. 7439-92-1	Revision Date 2015-11-23

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.Lead	CAS-No. 7439-92-1	Revision Date 2009-02-01
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.Lead	CAS-No. 7439-92-1	Revision Date 2009-02-01

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.1 Revision Date: 01/15/2020 Print Date: 05/29/2020

SAFETY DATA SHEET

Version 6.3
Revision Date 01/10/2020
Print Date 06/02/2020

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : PAHs by HPLC - PT

Product Number : SPE017
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

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

3.2 Mixtures

Component		Classification	Concentration
Quartz (SiO2)			
CAS-No. EC-No.	14808-60-7 238-878-4		>= 90 - <= 100 %
Anthracene			
CAS-No. EC-No.	120-12-7 204-371-1	Carc. 1A; Aquatic Acute 1; Aquatic Chronic 1; H350, H400, H410 M-Factor - Aquatic Acute: 1,000 M-Factor - Aquatic Chronic: 1,000	< 0.1 %
Benzo[ghi]perylene Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)			
CAS-No. EC-No.	191-24-2 205-883-8	Aquatic Acute 1; Aquatic Chronic 1; H400, H410 M-Factor - Aquatic Acute: 1,000 - Aquatic Chronic: 1,000	< 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. 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
silicon 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.

Recommended storage temperature 2 - 8 °C
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
Quartz (SiO2)	14808-60-7	TWA	0.05 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	Substance listed; for more information see OSHA document 1910.1053 See Table Z-3 for the exposure limit for any operations or sectors where the exposure limit in § 1910.1053 is stayed or is otherwise not in effect.		
		TWA	10mg/m3 / %SiO2+2	USA. Occupational Exposure Limits (OSHA) - Table Z-3 Mineral Dusts
		This standard applies to any operations or sectors for which the respirable crystalline silica standard, 1910.1053, is stayed or is otherwise not in effect. Both concentration and percent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics: Aerodynamic diameter (unit density sphere): 2; Percent passing selector: 90 Aerodynamic diameter (unit density sphere): 2,5; Percent passing selector: 75 Aerodynamic diameter (unit density sphere): 3,5; Percent passing selector: 50 Aerodynamic diameter (unit density sphere): 5,0; Percent passing selector: 25 Aerodynamic diameter (unit density sphere): 10; Percent passing selector: 0 The measurements under this note refer to the use of an AEC (now NRC) instrument. The respirable fraction of coal dust is determined with an MRE; the figure corresponding to that of 2.4 mg/m3 in the table for coal dust is 4.5 mg/m3.		
		TWA	250mppcf / %SiO2+5	USA. Occupational Exposure Limits (OSHA) - Table Z-3 Mineral Dusts
		This standard applies to any operations or sectors for which the respirable crystalline silica standard, 1910.1053, is stayed or is otherwise not in effect. Millions of particles per cubic foot of air, based on impinger samples counted by light-field techniques. The percentage of crystalline silica in the formula is the amount determined from airborne samples, except in those instances in which other methods have been shown to be applicable.		
		PEL	0.05 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		The concentration and percentage of the particulate used for this limit are determined from the fraction passing a size		

		selector with the following characteristics: Aerodynamic Diameter in Micrometers (unit density sphere)..... Percent Passing Selector 0 ..... 100 1 ..... 97 2 ..... 91 3 ..... 74 4 ..... 50 5 ..... 30 6 ..... 17 7 ..... 9 8 ..... 5 10 ..... 1 see also Sections 1532.3 & 5204		
		TWA	0.025 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Lung cancer Pulmonary fibrosis Suspected human carcinogen		
		TWA	0.05 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
Anthracene	120-12-7	TWA	0.2 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	0.1 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/m3	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/m3	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.		
Benzo[ghi]perylene	191-24-2	PEL	0.2 mg/m3	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			
Benzo[ghi]perylene	191-24-2	1-Hydroxypyrene	2.5 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		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.

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. - silicon 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

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.

Liver - 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
Harmful to aquatic life with long lasting effects.
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

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
This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Quartz (SiO2)	CAS-No. 14808-60-7	Revision Date 1989-08-11
Quartz (SiO2)	CAS-No. 14808-60-7	Revision Date 1989-08-11

New Jersey Right To Know Components

Quartz (SiO2)	CAS-No. 14808-60-7	Revision Date 1989-08-11

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

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: 6.3 Revision Date: 01/10/2020 Print Date: 06/02/2020

SAFETY DATA SHEET

Version 8.1
Revision Date 03/28/2020
Print Date 05/29/2020

SECTION 1: Identification of the substance/mixture and of the company/undertaking

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 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 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
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 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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Perchloroethylene PCE
Formula	:	C_2Cl_4
Molecular weight	:	165.83 g/mol
CAS-No.	:	127-18-4
EC-No.	:	204-825-9
Index-No.	:	602-028-00-4

Component	Classification	Concentration
Tetrachloroethylene		
	Skin Irrit. 2; Eye Irrit. 2A;	<= 100 %

	Skin Sens. 1; Carc. 2; STOT SE 3; Aquatic Acute 2; Aquatic Chronic 2; H315, H319, H317, H351, H336, H401, H411 Concentration limits: >= 20 %: STOT SE 3, H336;	

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, 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. 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.

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): 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
Tetrachloroethylene	127-18-4	TWA	25 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 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
		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	3parts per million	In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
	Remarks	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.

SECTION 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,	No data available

gas)

j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	25.3 hPa at 25.0 °C (77.0 °F) 17.3 hPa at 20.0 °C(68.0 °F)
l)	Vapour density	No data available
m)	Relative density	1.623 g/cm3 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)

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, 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

SECTION 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 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

Repeated dose toxicity - Mouse - female - Oral - Lowest observed adverse effect level - 390 mg/kg
RTECS: KX3850000

narcosis, Liver injury may occur., Kidney injury may occur.

SECTION 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(Tetrachloroethylene)

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.

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: 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

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
Tetrachloroethylene	127-18-4	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Reportable Quantity : D039 lbs

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

California Prop. 65 Components

	CAS-No.	Revision Date
, which is/are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.Tetrachloroethylene	127-18-4	2017-04-11

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 8.1 Revision Date: 03/28/2020 Print Date: 05/29/2020

SAFETY DATA SHEET

Version 6.10
Revision Date 03/21/2020
Print Date 05/29/2020

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Toluene

Product Number : 244511
Brand : Sigma-Aldrich
Index-No. : 601-021-00-3
CAS-No. : 108-88-3

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

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 2), H225
Skin irritation (Category 2), H315
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Specific target organ toxicity - repeated exposure (Category 2), Central nervous system, H373
Aspiration hazard (Category 1), H304
Short-term (acute) aquatic hazard (Category 2), H401
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	
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.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs (Central nervous system) through prolonged or repeated exposure.
H401	Toxic to aquatic life.
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.
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): 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.
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.
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

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	C_7H_8
Molecular weight	:	92.14 g/mol
CAS-No.	:	108-88-3
EC-No.	:	203-625-9
Index-No.	:	601-021-00-3

Component	Classification	Concentration
Toluene		
	Flam. Liq. 2; Skin Irrit. 2; Repr. 2; STOT SE 3; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 3; H225, H315, H361, H336, H373, H304, H401, H412 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.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

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
Combustible.

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.
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.

Handle and store under inert gas.
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
Toluene	108-88-3	TWA	100 ppm 375 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	150 ppm 560 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
	Remarks	Z37.12-1967		
		CEIL	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.12-1967		
		Peak	500 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.12-1967		
		TWA	20 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Visual impairment Female reproductive Pregnancy loss 2018 Adoption Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	100 ppm 375 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	150 ppm 560 mg/m3	USA. NIOSH Recommended Exposure Limits

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Toluene	108-88-3	Toluene	0.02 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Prior to last shift of workweek			
		Toluene	0.03 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

		o-Cresol	0.3mg/g Creatinine	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	Inhalation	Acute systemic effects	384 mg/m3
Workers	Inhalation	Acute local effects	384 mg/m3
Workers	Skin contact	Long-term systemic effects	384mg/kg BW/d
Workers	Inhalation	Long-term systemic effects	192 mg/m3
Workers	Inhalation	Long-term local effects	192 mg/m3
Consumers	Inhalation	Acute systemic effects	226 mg/m3
Consumers	Inhalation	Acute local effects	226 mg/m3
Consumers	Skin contact	Long-term systemic effects	226mg/kg BW/d
Consumers	Inhalation	Long-term systemic effects	56.5 mg/m3
Consumers	Ingestion	Long-term systemic effects	8.13mg/kg BW/d

Predicted No Effect Concentration (PNEC)

Compartment	Value
Soil	2.89 mg/kg
Marine water	0.68 mg/l
Fresh water	0.68 mg/l
Marine sediment	16.39 mg/kg
Fresh water sediment	16.39 mg/kg
Sewage treatment plant	13.61 mg/l
Aquatic intermittent release	0.68 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: 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, 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
b)	Odour	benzene-like
c)	Odour Threshold	No data available
d)	pH	Not applicable
e)	Melting point/freezing point	Melting point/range: -93 °C (-135 °F)
f)	Initial boiling point and boiling range	110 - 111 °C 230 - 232 °F
g)	Flash point	4.0 °C (39.2 °F) - c.c.
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 7.1 %(V) Lower explosion limit: 1.2 %(V)
k)	Vapour pressure	30.88 hPa at 21.1 °C (70.0 °F)
l)	Vapour density	3.18
m)	Relative density	0.865 g/mL at 25 °C (77 °F)

n)	Water solubility	0.58 g/l at 25 °C (77 °F) - partly soluble
o)	Partition coefficient: n-octanol/water	log Pow: 2.73 at 20 °C (68 °F) - Bioaccumulation is not expected.
p)	Auto-ignition temperature	535.0 °C (995.0 °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

Conductivity	< 0.01 µS/cm
Surface tension	27.73 mN/m at 0.516g/l at 25 °C (77 °F)
Relative vapour density	3.18

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
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

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male - 5,580 mg/kg
(Tested according to Directive 92/69/EEC.)
LC50 Inhalation - Rat - male and female - 4 h - 25.7 mg/l
(OECD Test Guideline 403)
LD50 Dermal - Rabbit - > 5,000 mg/kg
Remarks: (ECHA)
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: irritating - 4 h
Remarks: (ECHA)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: slight irritation
(OECD Test Guideline 405)

Respiratory or skin sensitisation
Maximisation Test - Guinea pig
Result: negative
(Regulation (EC) No. 440/2008, Annex, B.6)

Germ cell mutagenicity
In vitro mammalian cell gene mutation test
Mouse lymphoma test
Result: negative
Ames test
S. typhimurium
Result: negative

Rat - Bone marrow
Result: negative
(ECHA)

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.

Specific target organ toxicity - single exposure
May cause drowsiness or dizziness. - Central nervous system

Specific target organ toxicity - repeated exposure
May cause damage to organs through prolonged or repeated exposure. - Central nervous system

Aspiration hazard
Aspiration hazard, Aspiration may cause pulmonary oedema and pneumonitis.

Additional Information
RTECS: XS5250000

Drowsiness, irritant effects, Dizziness, Convulsions, Headache, Nausea, Vomiting, Circulatory collapse, somnolence, inebriation, Unconsciousness, respiratory arrest, CNS disorders, respiratory paralysis, death
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	flow-through test LC50 - Oncorhynchus kisutch (coho salmon) - 5.5 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Ceriodaphnia dubia (water flea) - 3.78 mg/l - 48 h (US-EPA)
Toxicity to bacteria	static test EC50 - Bacteria - 84 mg/l - 24 h Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 20 d Result: 86 % - Readily biodegradable. Remarks: (IUCLID)
Theoretical oxygen demand	3,130 mg/g Remarks: (Lit.)

12.3 Bioaccumulative potential

Bioaccumulation	Leuciscus idus (Golden orfe) - 3 d - 0.05 mg/l(Toluene) Bioconcentration factor (BCF): 90

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

Contact a licensed professional waste disposal service to dispose of this material. 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.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
UN number: 1294 Class: 3 Packing group: II
Proper shipping name: Toluene
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1294 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: TOLUENE

IATA
UN number: 1294 Class: 3 Packing group: II
Proper shipping name: Toluene

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
Toluene	108-88-3	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.

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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: 6.10 Revision Date: 03/21/2020 Print Date: 05/29/2020

SAFETY DATA SHEET

Version 6.5
Revision Date 05/06/2021
Print Date 06/15/2021

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Residual Solvent Class 2 - Xylenes

Product Number : 1601849
Brand : US Pharmacopeia

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 4), H227
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)
H227 Combustible liquid.
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.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
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.
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

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Component		Classification	Concentration
dimethyl sulphoxide			
CAS-No. EC-No. Registration number	67-68-5 200-664-3 01-2119431362-50-XXXX	Flam. Liq. 4; H227	>= 90 - <= 100 %
ethylbenzene			
CAS-No. EC-No. Index-No.	100-41-4 202-849-4 601-023-00-4	Flam. Liq. 2; Acute Tox. 4; Carc. 2; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 3; H225, H332, H351, H373, H304, H401, H412	>= 0.1 - < 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

If inhaled
After inhalation: fresh air.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Remove contact lenses.

If swallowed
After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

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
Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Sulfur oxides
Combustible.
Vapors are heavier than air and may spread along floors.
Forms explosive mixtures with air on intense heating.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters
In the event of fire, wear self-contained breathing apparatus.

5.4 Further information
Remove container from danger zone and cool with water. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Do not breathe vapors, aerosols. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Change contaminated clothing. Wash hands after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed.
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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
dimethyl sulphoxide	67-68-5	TWA	250 ppm	USA. Workplace Environmental Exposure Levels (WEEL)
ethylbenzene	100-41-4	TWA	100 ppm 435 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	100 ppm 435 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	125 ppm 545 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		PEL	5 ppm 22 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	30 ppm 130 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

ethylbenzene	100-41-4	Sum of mandelic acid and phenyl glyoxylic acid	0.15g/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
Change contaminated clothing. Wash hands after working with substance.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection
not required

Respiratory protection
Not required; except in case of aerosol formation.

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: liquid
b)	Odor	No data available
c)	Odor 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	75 °C (167 °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)	Vapor pressure	No data available
l)	Vapor 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)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
Forms explosive mixtures with air on intense heating.
A range from approx. 15 Kelvin below the flash point is to be rated as critical.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks.
Strong heating.

10.5 Incompatible materials
Light and/or alkaline metals, Isocyanates

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Mixture

Acute toxicity
Oral: 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 sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity
Evidence of a carcinogenic effect.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (ethylbenzene)

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.
Hazardous properties cannot be excluded but are unlikely when the product is handled appropriately.

Eyes - Eye disease - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

Components

dimethyl sulphoxide

Acute toxicity
LD50 Oral - Rat - male and female - 28,300 mg/kg
(OECD Test Guideline 401)
LC0 Inhalation - Rat - male and female - 4 h - > 5.33 mg/l
(OECD Test Guideline 403)
LD50 Dermal - Rat - male and female - 40,000 mg/kg
Remarks: (ECHA)
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: slight irritation - 4 h

(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: slight irritation - 24 h
(OECD Test Guideline 405)

Respiratory or skin sensitization
Maximization Test - Guinea pig
Result: negative
(OECD Test Guideline 406)
Local lymph node assay (LLNA) - Mouse
Result: negative
(OECD Test Guideline 429)

Germ cell mutagenicity
Ames test
Salmonella typhimurium
Result: negative
sister chromatid exchange assay
Chinese hamster ovary cells
Result: negative
Mutagenicity (mammal cell test): chromosome aberration.
Chinese hamster ovary cells
Result: negative
OECD Test Guideline 474
Rat - male and female
Result: negative

Carcinogenicity
No data available

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

ethylbenzene

Acute toxicity
LD50 Oral - Rat - male and female - 3,500 mg/kg
Remarks: (ECHA)
LC50 Inhalation - Rat - male - 4 h - 17.8 mg/l
Remarks: (ECHA)
LD50 Dermal - Rabbit - 15,433 mg/kg
Remarks: (RTECS)
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Moderate skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation
Remarks: (ECHA)

Respiratory or skin sensitization
Patch test: - Human
Result: negative
Remarks: (IUCLID)

Germ cell mutagenicity
Mutagenicity (mammal cell test):
Mouse lymphoma test
Result: negative
Ames test
Salmonella typhimurium
Result: negative
Hamster
ovary
Result: negative
OECD Test Guideline 474
Mouse - male and female
Result: negative

Carcinogenicity

Reproductive toxicity
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. - hearing organs

Aspiration hazard
May be fatal if swallowed and enters airways.

SECTION 12: Ecological information

12.1 Toxicity

Mixture
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

Components

dimethyl sulphoxide

Toxicity to fish	static test LC50 - Danio rerio (zebra fish) - > 25,000 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 24,600 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	static test ErC50 - Pseudokirchneriella subcapitata (green algae) - 17,000 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	EC50 - activated sludge - 10 - 100 mg/l - 30 min (ISO 8192)

ethylbenzene

Toxicity to fish	semi-static test LC50 - Oncorhynchus mykiss (rainbow trout) - 4.2 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 1.8 - 2.4 mg/l - 48 h (US-EPA)
Toxicity to algae	static test EC50 - Pseudokirchneriella subcapitata (green algae) - 3.6 mg/l - 96 h (US-EPA)
Toxicity to bacteria	EC50 - Photobacterium phosphoreum - 9.68 mg/l - 30 min Remarks: (IUCLID)

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

NA-Number: 1993 Class: NONE Packing group: III
Proper shipping name: Combustible liquid, n.o.s. (DMSO (USP Specification))
Reportable Quantity (RQ): 100 lbs

Reportable Quantity (RQ):
Poison Inhalation Hazard: No

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 TPQ.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
ethylbenzene	100-41-4	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Chronic Health Hazard

Reportable Quantity : F003 lbs

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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: 6.5 Revision Date: 05/06/2021 Print Date: 06/15/2021

HASP ATTACHMENT C
REPORT FORMS

WEEKLY SAFETY REPORT FORM

Week Ending: _____ Project Name/Number: _____

Report Date: _____ Project Manager Name: _____

Summary of any violations of procedures occurring that week:

_____

_____

_____

Summary of any job-related injuries, illnesses, or near misses that week:

_____

_____

_____

_____

Summary of air monitoring data that week (include and sample analyses, action levels exceeded, and actions taken):

_____

_____

_____

Comments:

_____

_____

_____

Name: _____ Company: _____

Signature: _____ Title: _____

INCIDENT REPORT FORM

Date of Report: _____

Injured: _____

Employer: _____

Site: _____ Site Location: _____

Report Prepared By: _____ _____
Signature Title

ACCIDENT/INCIDENT CATEGORY (check all that applies)

___Injury	___ Illness	___ Near Miss
__ Property Damage	___ Fire	___ Chemical Exposure
__ On-site Equipment	___ Motor Vehicle	___ Electrical
__ Mechanical	___ Spill	___ Other

DATE AND TIME OF ACCIDENT/INCIDENT: Narrative report of Accident/Incident: Identify: 1) actions leading to or contributing to the accident/incident; 2) the accident/incident occurrence; and 3) actions following the accident/incident.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

WITNESS TO ACCIDENT/INCIDENT:

Name:	_____	Company:	_____
Address:	_____	Address:	_____
Phone No.:	_____	Phone No.:	_____
Name:	_____	Company:	_____
Address:	_____	Address:	_____
Phone No.:	_____	Phone No.:	_____

INJURED - ILL:

Name: _____ SSN: _____

Address: _____ Age: _____

Length of Service: _____ Time on Present Job: _____

Time/Classification: _____

SEVERITY OF INJURY OR ILLNESS:

____ Disabling ___ Non-disabling ___ Fatality

____ Medical Treatment ___ First Aid Only

ESTIMATED NUMBER OF DAYS AWAY FROM JOB: _____

NATURE OF INJURY OR ILLNESS: _____

_____

_____

_____

CLASSIFICATION OF INJURY:

__ Abrasions	_____ Dislocations	____ Punctures
__ Bites	_____ Faint/Dizziness	____ Radiation Burns
__ Blisters	_____ Fractures	____ Respiratory Allergy
__ Bruises	_____ Frostbite	____ Sprains
__ Chemical Burns	_____ Heat Burns	____ Toxic Resp. Exposure
__ Cold Exposure	_____ Heat Exhaustion	____ Toxic Ingestion
__ Concussion	_____ Heat Stroke	____ Dermal Allergy
__ Lacerations		

Part of Body Affected: _____

Degree of Disability: _____

Date Medical Care was Received: _____

Where Medical Care was Received: _____

Address (if off-site): _____

(If two or more injuries, record on separate sheets)

PROPERTY DAMAGE:

Description of Damage: _____

_____

Cost of Damage: $ _____

ACCIDENT/INCIDENT LOCATION: _____

ACCIDENT/INCIDENT ANALYSIS: Causative agent most directly related to accident/incident (Object, substance, material, machinery, equipment, conditions)

_____

_____

_____

_____

Was weather a factor?:_____

_____

Unsafe mechanical/physical/environmental condition at time of accident/incident (Be specific):

_____

_____

_____

Personal factors (Attitude, knowledge or skill, reaction time, fatigue):

_____

_____

ON-SITE ACCIDENTS/INCIDENTS:

Level of personal protection equipment required in Site Safety Plan:

_____

_____

Modifications:

_____

Was injured using required equipment?:

_____

_____

If not, how did actual equipment use differ from plan?:

_____

_____

ACTION TAKEN TO PREVENT RECURRENCE: (Be specific. What has or will be done? When will it be done? Who is the responsible party to ensure that the correction is made?

ACCIDENT/INCIDENT REPORT REVIEWED BY:

SSO Name Printed | SSO Signature

OTHERS PARTICIPATING IN INVESTIGATION:

Signature | Title

Signature | Title

Signature | Title

ACCIDENT/INCIDENT FOLLOW-UP: Date: _____

Outcome of accident/incident: _____

Physician's recommendations: _____

Date injured returned to work: _____

Follow-up performed by:

Signature | Title

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM

HASP ATTACHMENT D
EMERGENCY HAND SIGNALS

EMERGENCY SIGNALS

In most cases, field personnel will carry portable radios for communication. If this is the case, a transmission that indicates an emergency will take priority over all other transmissions. All other site radios will yield the frequency to the emergency transmissions.

Where radio communications are not available, the following air-horn and/or hand signals will be used:

EMERGENCY HAND SIGNALS

OUT OF AIR, CAN'T BREATHE!

Hand gripping throat

LEAVE AREA IMMEDIATELY, NO DEBATE!

(No Picture) Grip partner's wrist or place both hands around waist

NEED ASSISTANCE!

Hands on top of head

OKAY! – I'M ALL RIGHT!

- I UNDERSTAND!

Thumbs up

NO! - NEGATIVE!

Thumbs down

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

FORMER EXCELSIOR BAG
YONKERS, NEW YORK

Quality Assurance Project Plan

NYSDEC BCP Site Number: C360190
AKRF Project Number: 200131

Prepared For:

New York State Department of Environmental Conservation
Division of Environmental Remediation, Remedial Bureau C
625 Broadway, 12th Floor
Albany, New York 12233

Prepared On Behalf Of:

Extell Hudson Waterfront LLC
805 Third Avenue, 7th Floor
New York, NY 10022

Prepared by:

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, New York 10016
212-696-0670

JANUARY 2022

TABLE OF CONTENTS

TABLES

ATTACHMENTS

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) describes the protocols and procedures that will be followed during implementation of the interim remedial measures (IRMs) at the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) Former Excelsior Bag Site (BCP Site No. C360190) located at 25, 35 and 45 Riverside Drive (f/k/a Alexander Street) in Yonkers, New York, hereafter referred to as the "Site." The Site is part of the area covered by a subdivision approved by the City of Yonkers Planning Board on April 11. 2018, for which the final subdivision map was filed with the Westchester County Clerk's office on January 24, 2020. The Site is now identified by the City of Yonkers Tax Map as Section 2, Block 2620, Lots 2, p/o 9, 10, 11, 12, Fisherman Way, Colman Way, and p/o Riverside Drive.

The objective of this QAPP is to provide for Quality Assurance (QA) and maintain Quality Control (QC) of environmental sampling activities conducted under the NYSDEC BCP. Adherence to this QAPP will ensure that defensible data will be obtained during environmental work at the Site.

2.0 PROJECT TEAM

The project team will be drawn from AKRF professional and technical personnel, and AKRF's subcontractors. All field personnel and subcontractors will have completed a 30-hour and 40-hour training course and updated 8-hour refresher course that meet the Occupational Safety and Health Administration (OSHA) requirements of 29 CFR Part 1910. The following sections describe the key project personnel and their responsibilities.

2.1 Project Director

Mr. Marc Godick, Qualified Environmental Professional (QEP), will serve as the Project Director and will be responsible for overall management and supervision of the project team. Mr. Godick's resume is included in Attachment A.

2.2 Quality Control (QA/QC) Officers

Ms. Rebecca Kinal, QEP, New York State Professional Engineer (NYSPE) will serve as the QA/QC officer and will be responsible for adherence to the QAPP. The QA/QC officer will review the procedures with all personnel prior to commencing any fieldwork and will conduct periodic Site visits to assess implementation of the procedures. The QA/QC officer will also be responsible for reviewing the Data Usability Summary Reports (DUSRs) prepared by a third-party data validator for soil analytical results. Ms. Kinal's resume is included in Attachment A.

2.3 Project Manager

The project manager will be responsible for directing and coordinating all elements of the IRMWP. The project manager will prepare reports and participate in meetings with the Site owner/Volunteer, and/or the NYSDEC. Scott Caporizzo will serve as the project manager for the IRM. Mr. Caporizzo's resume is included in Attachment A.

2.4 Field Team Leader, Field Technician, Site Safety Officer (SSO), and Alternates

The field team leader will be responsible for supervising the daily sampling and health and safety activities in the field and will ensure adherence to the work plan and Health and Safety Plan (HASP), included as Appendix A of the RIWP. The field team leader will also act as the field technician and Site Safety Officer (SSO), and will report to the project manager or project manager alternate on a regular basis regarding daily progress and any deviations from the work plan. The field team leader will be a qualified and responsible person able to act professionally and promptly during environmental work at the Site. Stephen Schmid will be the field team leader. The field team leader alternate is John Sulich of AKRF. Mr. Schmid's and Mr. Sulich's resumes are included in Attachment A.

2.5 Laboratory Quality Assurance/Quality Control (QA/QC) Officer

The laboratory QA/QC officer will be responsible for quality control procedures and checks in the laboratory and ensuring adherence to laboratory protocols. The QA/QC officer will track the movement of samples from the time they are checked in at the laboratory to the time that analytical results are issued, and will conduct a final check on the analytical calculations and sign off on the laboratory reports. The laboratory QA/QC officer will be Melissa Sturgis of Alpha Analytical (Alpha), the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory being employed for all environmental sampling at the Site.

2.6 Thirty-Party Data Validator

The third-party data validator will be responsible for reviewing the final data packages for soil, groundwater, and soil vapor and preparing a DUSR that will provide performance information with regard to accuracy, precision, sensitivity, representation, completeness, and comparability associated with the laboratory analyses for the investigation. The third-party data validator will be Lori Beyer of L.A.B. Validation Corporation of East Northrop, New York.

3.0 STANDARD OPERATING PROCEDURES (SOPS)

The following sections describe the SOPs for the remedial activities included in the IRMWP. During these activities, safety monitoring will be performed as described in the HASP, included as Appendix A of the IRMWP.

3.1 Decontamination of Sampling Equipment

All sampling equipment (hand augers, sampling spoons, etc.) will be either dedicated or decontaminated between sampling locations. Decontamination will be conducted on plastic sheeting (or equivalent) or using buckets to prevent discharge to the ground. The decontamination procedure will be as follows:

1. Scrub using tap water/Alconox® mixture and bristle brush.
2. Rinse with tap water.
3. Scrub again with tap water/Alconox® mixture and bristle brush.
4. Rinse with tap water.
5. Rinse with distilled water.
6. Air-dry the equipment, if possible.

3.2 Management of Investigation-Derived Waste (IDW)

IDW will be containerized in New York State Department of Transportation (NYSDOT)-approved 55-gallon drums. The drums will be sealed at the end of each work day and labeled with the date, the well or soil boring number (i.e., drill cuttings), and the name and phone number of an AKRF point-of-contact. All IDW exhibiting field evidence of contamination will be disposed of or treated according to applicable local, state, and federal regulations.

4.0 SAMPLING AND LABORATORY PROCEDURES

4.1 Soil Sampling

Soil sampling will be conducted according to the following procedures:

- Characterize the sample according to the modified Burmister soil classification system.
- Field screen the sample for evidence of contamination (e.g., odors, staining, etc.) using visual and olfactory methods and screen for volatile organic compounds (VOCs) using a photoionization detector (PID) equipped with a 10.6 electron Volt (eV) lamp.
- Collect an aliquot of soil from each proposed sample location, place in laboratory-supplied glassware, label the sample in accordance with Section 4.6.1, and place in an ice-filled cooler for shipment to the laboratory.
- Complete the proper chain of custody (COC) paperwork and seal the cooler.
- Record sample location, sample depth, and sample observations (evidence of contamination, PID readings, soil classification, etc.) in field log book and boring log data sheet, if applicable.
- Decontaminate any soil sampling equipment between sample locations as described in Section 3.1 of this QAPP.

4.2 Laboratory Methods

Table 1A summarizes the laboratory methods that will be used to analyze field samples and the sample container type, preservation, and applicable holding times. A NYSDOH ELAP-certified laboratory subcontracted to AKRF, will be used for all chemical analyses in accordance with the Division of Environmental Remediation (DER)-10 2.1(b) and 2.1(f) with Category B Deliverables. Tables 1B and 1C provide further detail on the remedial investigation samples, including, boring IDs, sample depths and quantities, and QA/QC sampling protocols.

Table 1A
Laboratory Analytical Methods for Analysis Groups

Matrix	Analysis	EPA Method	Bottle Type	Preservative	Hold Time
Soil and Soil QA/QC	Volatile Organic Compounds (VOCs)	8260C	EnCore® samplers (3) and 2 oz. plastic jar	≤ 6 ºC	48 hours to extract; 14 days to analyze
	Semivolatile Organic Compounds (SVOCs)	8270D	8 oz. Glass Jar	≤ 6 ºC	14 days to extract; 40 days to analyze
	1,4-Dioxane	8270D 0.1 mg/kg RL	4 oz. Glass Jar	≤ 6 ºC	14 days to extract; 40 days to analyze
	Total Analyte List (TAL) Metals, Hexavalent Chromium, and Cyanide	6000/7000 Series, 6010C, 7196A, and 9010C/9012B	8 oz. Glass Jar	≤ 6 ºC	6 months holding time; Mercury 28 days holding time; Hexavalent chromium 30 days to extract, 7 days to analyze
	Pesticides	8081B/8151A	8 oz. Glass Jar	≤ 6 ºC	14 days to extract; 40 days to analyze
	Polychlorinated Biphenyls (PCBs)	8082A	8 oz. Glass Jar	≤ 6 ºC	14 days to extract; 40 days to analyze
	Per- and Polyfluorinated Compounds (PFAS)	Modified 537 SIM-isotope dilution; 0.5 µg/kg RL	4 oz. HDPE Plastic Container	≤ 6 ºC	14 days to extract; 40 days to analyze

Notes:
QA/QC samples will be analyzed for the same parameters as the parent sample, with the exception of the trip blank(s), which will be analyzed for VOCs by EPA Method 8260C only.
EPA – Environmental Protection Agency
Hg – Mercury
RCRA – Resource Conservation and Recovery Act
µg/kg – parts per billion
µg/L – parts per billion
ng/L – parts per trillion

Table 1B
Proposed Remedial Investigation Sample Locations

Matrix	Sample ID	Soil Sample Depth	Proposed Number of Samples
Soil	RI-SB-24N	1 to 3 feet below ground surface.	Following removal of the 10-foot by 10-foot by 5-foot deep SVOC source excavation area and any encountered grossly contaminated media, four sidewall confirmatory endpoint samples will be collected (one from each sidewall).
	RI-SB-24E		
	RI-SB-24S		
	RI-SB-24W		
	UST-1N	3 to 6 feet below ground surface (the exact depths and locations will be coordinated with NYSDEC prior to initiating sampling)	In the event that a UST is encountered and removed, five endpoint samples consisting of four sidewalls and one bottom sample will be obtained following removal of the tank and any encountered grossly contaminated media.
	UST-1E		
	UST-1S		
	UST-1W		
	UST-1B		
Notes: QA/QC sampling is further detailed in Section 4.5.			

4.3 Quality Control (QC) Sampling

In addition to the laboratory analysis of the soil samples, additional analysis will be included for QC measures, as required by the Category B sampling techniques. These samples will include field blank, trip blank, matrix spike/matrix spike duplicate (MS/MSD), and blind duplicate samples at a frequency of one sample per 20 field samples collected. QC samples will be analyzed for the same parameters as the accompanying samples, with the exception of any trip blanks, which will be analyzed for the VOC list only.

Based on the frequency of one QA/QC sample set per 20 field samples collected, it is estimated that one sets of QA/QC samples will be collected for soil and one set will be collected for groundwater. A summary of sampling quantities and QA/QC samples to be collected is provided in Table 1C.

Table 1C
Proposed Remedial Investigation Sample Quantities

Media/Sample Type	Qty.	Interval	VOCs	SVOCs
Soil – SVOC Source Area	4	Sidewall		x
Soil – UST Area	5	Bottom	x	x
		Sidewall	x	x
QC Samples (Soil)	1	1 per 20	Trip, Field, MS/MSD, Dup	Field, MS/MSD, Dup

Notes: VOCs = TCL VOCs by Method 8260 for soil and groundwater, TO-15 for soil vapor samples
SVOCs = TCL SVOCs + 1,4-Dioxane by Method 8270

4.4 Sample Handling

4.4.1 Sample Identification

All samples will be consistently identified in all field documentation, chain-of-custody (COC) documents, and laboratory reports. Soil samples collected during the IRM will be

identified with "RI-SB-24" and "UST-1" for soil samples. All samples will be amended with the collection date at the end of the sample name in a year, month, day (YYYYMMDD) format. Blind duplicate sample nomenclature will consist of the sample type, followed by an "X"; MS/MSD samples nomenclature will consist of the parent sample name only, but triplicate sample volume will be collected and the COC comment section will explain that the additional volume is for running the MS/MSD; and trip and field blanks will consist of "TB-" and "FB-", respectively, and a sequential number of the trip/field blanks collected within the sample digestion group (SDG). Special characters, including primes/apostrophes ('), will not be used for sample nomenclature and all sample numbers 1-9 will contain a leading zero. Table 2 provides examples of the sampling identification scheme for samples collected during the IRM.

Table 2
Interim Remedial Measure Sample Nomenclature

Sample Description	Sample Designation
Soil sample collected from north sidewall of the SVOC source area excavation between 1 and 3 feet below grade on February 15, 2022	RI-SB-24N _1-3_20220215
Soil sample collected from south sidewall of the UST excavation between 3 and 5 feet below grade on February 15, 2022	UST-1S _3-5_20220215
Matrix spike/matrix spike duplicate of soil sample collected from north sidewall of the SVOC source area excavation between 1 and 3 feet below grade on February 15, 2022	RI-SB-24N _1-3_20220215
Blind duplicate soil sample collected from the SVOC source area on February 15, 2022	RI-SB-24X _1-3_20220215
Field blank collected during the UST area excavation on February 15, 2022 with the soil samples	UST-FB_20220215

Sample Labeling and Shipping

All sample containers will be provided with labels containing the following information:

- Project identification, including Site name, BCP Site number, Site address
- Sample identification
- Date and time of collection
- Analysis(es) to be performed
- Sampler's initials

Once the samples are collected and labeled, they will be placed in chilled coolers and stored in a cool area away from direct sunlight to await shipment to the laboratory. All samples will be shipped to the laboratory at least twice per week or as needed to accommodate holding times. At the start and end of each workday, field personnel will add ice to the cooler(s) as needed.

The samples will be prepared for shipment by placing each sample in laboratory-supplied glassware, then wrapping each container in bubble wrap to prevent breakage, and adding freezer packs and/or fresh ice in sealable plastic bags. The COC form will be properly

completed by the sampler in ink, and all sample shipment transactions will be documented with signatures, and the date and time of custody transfer. Samples will be shipped overnight (e.g., Federal Express) or transported by a laboratory courier. All coolers shipped to the laboratory will be sealed with mailing tape and a COC seal to ensure that the samples remain under strict COC protocol.

Sample Custody

Field personnel will be responsible for maintaining the sample coolers in a secured location until they are picked up and/or sent to the laboratory. The record of possession of samples from the time they are obtained in the field to the time they are delivered to the laboratory or shipped off-site will be documented on COC forms. The COC forms will contain the following information: project name; names of sampling personnel; sample number; date and time of collection and matrix; and signatures of individuals involved in sample transfer, and the dates and times of transfers. Laboratory personnel will note the condition of the custody seal and sample containers at sample check-in.

4.5 Field Instrumentation

Field personnel will be trained in the proper operation of all field instruments at the start of the field program. Instruction manuals for the equipment will be on file at the Site for referencing proper operation, maintenance, and calibration procedures. The equipment will be calibrated according to manufacturer specifications at the start of each day of fieldwork. If an instrument fails calibration, the project manager or QA/QC officer will be contacted immediately to obtain a replacement instrument. A calibration log will be maintained to record the date of each calibration, any failure to calibrate and corrective actions taken. The PID will be equipped with a 10.6 eV lamp and will be calibrated each day using 100 parts per million (ppm) isobutylene standard gas in accordance with the manufacturer's standards.

4.6 Quality Assurance (QA)

All soil laboratory analytical data will be reviewed by a third-party validator and a DUSR will be prepared to document the usability and validity of the data. The Interim Remedial Measure Completion Construction Report (IRM CCR) will include a detailed description of endpoint sampling activities, data summary tables, concentration map showing sample locations and concentrations, DUSR, and laboratory reports.

ATTACHMENT A

RESUMES OF QA/QC OFFICER AND PROJECT DIRECTOR, PROJECT MANAGER, AND FIELD TEAM LEADER/FIELD TECHNICIAN/SITE SAFETY OFFICER/ALTERNATE

REBECCA KINAL, PE

PROGRAM MANAGER

Rebecca Kinal, PE has extensive experience in the assessment and remediation of soil and groundwater contamination and other hazardous/non-hazardous waste problems. Ms. Kinal's experience includes environmental due diligence, soil and groundwater investigations, leaking underground storage tank studies, soil gas/vapor intrusion surveys, and oversight of small- and large-scale remediation programs, including design of groundwater remediation systems and vapor mitigation systems. She has directed numerous Phase I and Phase II assessments and remediation programs, many of them in conjunction with commercial/residential developers, law firms, lending institutions, and public agencies. She is experienced in the cleanup of contaminated properties under New York State Brownfield Cleanup Program (BCP) regulations and the New York City "E-designation" program. As a part of this work, her duties have included technical and report review, engineering design, proposal writing, scheduling, budgeting, and acting as liaison between clients and regulatory agencies, and project coordination with federal, state, and local authorities.

BACKGROUND

Education
MS, Rensselaer Polytechnic Institute, Hydrogeology, 1995
BS, Lafayette College, Civil Engineering, 1992

Licenses/Certifications
Professional Engineer, NY - 082046-1
OSHA 40 Hour HAZWOPER,
OSHA 8 Hour Refresher

Years of Experience
23 years in the industry
19 years with AKRF

References:
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Long Island City, NY 11101-3405
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Olmsted Center, Flushing Meadows-Corona Park
Corona, NY 11368
Kay.Zias@parks.nyc.gov
Phone: (718) 760-6748

RELEVANT EXPERIENCE

New York City School Construction Authority On-Call Contracts for Environmental Consulting Services, Various Sites, NY

Ms. Kinal has served as the project manager for AKRF's on-call hazardous materials consulting contract with the New York City School Construction Authority for over 10 years. For potential new school sites, assignments include initial due diligence; Phase I environmental site assessments (ESAs); and subsurface investigation of soil, groundwater, and soil vapor to determine the suitability of a site for development as a school, likely remediation requirements, and associated costs. For sites undergoing design and development, assignments include preparation of remediation plans, contract specifications, and design drawings. The work has also included conducting indoor air quality testing, vapor intrusion assessments, preparation of specifications and construction management for petroleum storage tank removals, and investigation and remediation of spills for existing schools. Due to the sensitivity of school sites, work under this contract is often conducted on short notice and during non-school hours. Under the contract, Ms. Kinal has managed several major efforts, including emergency remediation work related to flooding from Superstorm Sandy, expedited due diligence for large portfolios of proposed Universal Pre-Kindergarten (UPK and 3K) sites, and large Phase II investigations of sites with NYC Office of Environmental Remediation (OER) E-designations and/or contamination warranting potential NYSDEC involvement.

Montefiore Medical Center, Various Locations, NY

Ms. Kinal provides environmental due diligence assistance to Montefiore Medical Center (MMC) for the ongoing expansion of their facilities, primarily in the Bronx and Westchester County. She conducts and manages environmental due diligence tasks related to their property transactions, including Phase I Environmental Site Assessments (ESAs), Phase II investigations, indoor air quality surveys/vapor intrusion assessments, and remediation cost estimates. She also assists MMC in making decisions with respect to environmental risk issues. Projects have ranged from small, single-lot properties to large hospital campuses.

Transaction Support, Confidential Client, Various Locations

Ms. Kinal provided transaction support related to the proposed sale of a large construction equipment supply company. She managed inspections of 12 of the company's storage and maintenance yards located in New York, New Jersey, Connecticut, Rhode Island and Massachusetts to assess environmental concerns, and advise the client regarding environmental liabilities related to the proposed sale. The work was completed on an expedited turnaround to comply with the due diligence time-frame.

Brooklyn Technical High School Athletic Field Improvements, Brooklyn, NY

Ms. Kinal provided environmental support services to the selected contractor for improvements to the Brooklyn Tech H.S. athletic field facilities. These services included: preparation of an in situ sampling plan for waste characterization

and disposal; supervision of waste characterization sampling activities; development and implementation of a community air monitoring program during all soil disturbance; and coordination for removal of a petroleum storage tank discovered construction.

Street-Works Development, Hamilton Green (200 Hamilton Avenue), White Plains, NY

AKRF prepared the EIS under the New York State Environmental Quality Review Act (SEQRA) and provided site planning and environmental services for the development of Hamilton Green—a new vibrant, mixed-use community in downtown White Plains, NY. Ms. Kinal managed environmental due diligence and remediation planning for the project, which included Phase I and II environmental assessments, a petroleum Spill investigation, preparation of remediation cost estimates, and application and acceptance to the NYSDEC Brownfield Cleanup Program (BCP).

Redevelopment at Polychrome R&D and Manufacturing Sites, AvalonBay, Yonkers, NY

Ms. Kinal served as the Engineer of Record for remediation of the former Polychrome research and development (R&D) site, a NYSDEC Brownfield redevelopment project along the Hudson River. The remediation included hot spot excavation, LNAPL collection, in-situ soil stabilization (ISS), soil management, groundwater treatment, dewatering, shoreline permitting, groundwater discharge permitting, and a site-wide engineered cover systems, including a vapor barrier and sub-slab depressurization system (SSDS). Ms. Kinal reviewed the design documents, supervised field inspections, provided support to the project team regarding contractor submittals and field changes, and certified the Final Engineering Report and Site Management Plan. The Site received its Certificate of Completion in December 2019.

New York City Department of Design & Construction (NYCDDC), East Side Coastal Resiliency (ESCR), New York, NY

AKRF was retained by the NYCDDC to provide a multi-disciplinary design for the protection of Lower Manhattan against another catastrophic hurricane. The main components of the design include levees, berms, retaining walls, cut-off walls, and increasing the ground elevation to mitigate and limit surging flood waters from entering Lower Manhattan. A large portion of the project's subsurface has been impacted by manufactured gas plant (MGP)-related contamination. Ms. Kinal serves as the Engineer of Record for MGP mitigation design components of the project. Her work includes certification of the Mitigation Work Plan submitted to NYSDEC and review of contract specifications and drawings.

United States Tennis Association, USTA NTC Master Plan Support, Queens, NY

AKRF prepared an EIS for the New York City Departments of City Planning (DCP) and Environmental Protection (DEP) as co-lead agencies to analyze the expansion of the National Tennis Center, which includes multiple improvements and construction projects at the USTA campus over several years. As part of the EIS requirements, AKRF prepared a Remedial Action Plan for implementation during the proposed project's construction. In accordance with the RAP, vapor mitigation systems were incorporated into the design for several of the proposed structures at the facility, including two new stadiums, a new transportation center, and several practice court facilities. Ms. Kinal prepared the specifications and design drawings for the vapor mitigation and provided construction support to review contractor submittals and inspect the vapor barrier and sub-slab depressurization system installations.

New York City Economic Development Corporation (NYCEDC), Yankee Stadium, Bronx, NY

Ms. Kinal performed the hazardous materials analysis for the Draft Environmental Impact Statement for the proposed new Yankee Stadium. The analysis included a Phase I Environmental Site Assessment of the entire project area and Subsurface (Phase II) Investigation in areas where environmental conditions were identified. The Phase II investigation included geophysical surveys to search for potential underground storage tanks; and soil, soil gas, and groundwater

sampling at over 40 locations to determine potential environmental impacts during and after the proposed construction. Remedial Action Plans (RAPs) and Construction Health and Safety Plans (CHASPs) were developed to specify environmental monitoring, soil management protocols, and health and safety requirements during construction of the new stadium and redevelopment of the old stadium site. Ms. Kinal also managed an extensive community air monitoring program during demolition of the old Yankee Stadium and construction of the New York City Department of Parks and Recreation's Heritage Field, which included short-term and long-term monitoring for airborne particulates and lead.

Roosevelt Union Free School District, Roosevelt UFSD

Ms. Kinal managed environmental investigation and remediation activities for the sites of three new elementary schools and a new middle school in Roosevelt, New York. Remediation activities include removal/closure of contaminated dry wells and underground petroleum storage tanks, and excavation and off-site disposal of petroleum- and pesticide-contaminated soil. Remediation of the new middle school site, which also included a sub-slab depressurization system, was conducted through coordination with the NYSDEC, NYSDOH, New York State Education Department (NYSED), and the local school district. Upon completion of the remediation and school construction, Ms. Kinal managed confirmatory indoor air testing and preparation of a Final Engineering Report to document the site clean-up. The NYSDEC issued a Certificate of Completion, allowing the new school to open on schedule.

SCOTT CAPORIZZO, EIT

ENVIRONMENTAL ENGINEER

Scott Caporizzo, EIT, is a project manager and field engineer in AKRF's Site Assessment and Remediation (SAR) department working out of the White Plains, New York office to provide services for projects requiring site assessment and remediation and regulatory compliance in the northeast. Mr. Caporizzo earned his bachelor's degree in environmental engineering from Lehigh University and through his career since holds extensive experience in conducting various environmental investigations, including media sampling, waste characterization and disposal coordination, long-term groundwater monitoring, and various other project and field manager duties. Mr. Caporizzo has a strong working knowledge of New York and New Jersey state and federal environmental regulations and compliance guidelines, as well as industry-wide assessment and remediation practices.

BACKGROUND

Education

BS, Lehigh University, Environmental Engineering, 2013

Licenses/Certifications

Engineer-in-Training, NY

OSHA 40 Hour HAZWOPER

OSHA 8 Hour Refresher

OSHA 10 Hour Construction Safety & Health Course DEC 4 Hour Erosion and Sediment Control (E&SC), New York State Department of Environmental Conservation

DOT HM-232 Security Awareness U.S. NRC Radiation Safety Officer and Nuclear Gauge Operator, United States Nuclear Regulatory Commission

Professional Memberships

Member, American Society of Civil Engineers

Years of Experience

8 years in the industry
1 year with AKRF

RELEVANT EXPERIENCE

Former General Motors Assembly Plant BCP Site, Sleepy Hollow, NY

While at a previous firm, Mr. Caporizzo provided field oversight and served as the project manager for the former General Motors Assembly Plant BCP Site in Sleepy Hollow, New York. Mr. Caporizzo provided on-site Site Management Plan (SMP)-compliance oversight services before transitioning into a full project managerial role. Mr. Caporizzo's responsibilities included operating and maintaining air monitoring equipment, screening soil with a photo-ionization detector for reuse on the site, preparing bi-weekly stormwater pollution prevention reports, tracking and documenting imported-fill operations, and documenting the installation of the final cover system. Mr. Caporizzo additionally served as the field lead during the implementation of a concrete slab sampling investigation performed in February 2015 and a soil vapor intrusion investigation performed in April 2017. In July 2017, Mr. Caporizzo transitioned to a full project manager role and provided client and New York State Department of Environmental Conservation

(NYSDEC) coordination services, and directly supervised the on-site construction environmental monitor. Mr. Caporizzo's responsibilities as project manager also included review of contractor Requests for Inquiry (RFIs) and submittals, review of on-site field personnel daily reports/operations, and preparation of various submittals as required per the SMP.

Avalon Bay Communities, Inc. Polychrome East & West BCP Sites, Yonkers, NY

Prior to joining AKRF, Caporizzo provided field oversight and work plan preparation services for the Polychrome East and West Brownfield Cleanup Program (BCP) Sites in Yonkers, NY. Mr. Caporizzo provided remedial investigation oversight services to determine the nature and extent of subsurface contamination in soil, groundwater, and soil vapor. Areas of dense non-aqueous phase liquid (DNAPL) and light non-aqueous phase liquid (LNAPL) were also identified on-site. Mr. Caporizzo also provided pre-design investigation oversight services for the pre-design investigation (POI) which utilized laser-induced fluorescence (LJF) drilling technologies (specifically, TarGOST) and confirmatory soil borings to delineate the nature and extent of the DNAPL-impacted soil. Mr. Caporizzo additionally contributed to the preparation of the remedial action work plans (RAWPs). The sites' remedial approach included in-situ soil solidification (ISS) of DNAPL plumes. Since joining AKRF, Mr. Caporizzo served as a lead author for the preparation of the Site Management Plans and currently assists in oversight of day to day redevelopment to document compliance with the NYSDEC-approved RAWPs. Following completion of remedial action, AKRF will prepare and submit the Final Engineering Reports.

Confidential Residential Property, Somerset County, NJ

Mr. Caporizzo served as a field engineer for the LSRP-led remediation of a former gasoline UST located on a farm property in the Watchung Mountain region of New Jersey. Following a site investigation (contamination screening), Mr. Caporizzo observed and documented the installation of a bioremediation treatment system designed to treat residual benzene and MTBE. Mr. Caporizzo also monitored various groundwater quality parameters in order to properly balance and maximize efficiency of the remedial system.

BICC BCP Site, Yonkers, NY

While at a previous firm, Mr. Caporizzo provided both project manager and field oversight services for the former BICC BCP Site in Yonkers, NY. Mr. Caporizzo provided remediation oversight services during dredging and sediment cover system (SCS) installation efforts for approximately 4,500 cubic yards of PCB impacted Hudson River sediments located below an H-pile-supported building slab that were characterized as hazardous under the Toxic Substances Control Act (TSCA) regulated by the Environmental Protection Agency (EPA). This multi-layer SCS, among other engineering controls installed at the site, was maintained under a Site Management Plan (SMP). Upon the issuance of the site's Certificate of Completion in April 2017, Mr. Caporizzo's responsibilities as the project manager included executing semi-annual groundwater monitoring events, an annual site-wide inspection of the site's engineering controls, fill import material sampling/review, and NYSDEC, EPA, and client coordination.

STEPHEN SCHMID

ASSOCIATE ENVIRONMENTAL SCIENTIST

Stephen Schmid is an Environmental Scientist in AKRF's Hazardous Materials Department with seven years of experience. He has experience in Phase I and II site assessments, construction oversight and remediation, potable water sampling, and conducting environmental sampling programs (subsurface soil investigations, waste characterization sampling, groundwater monitoring, and indoor air quality/vapor intrusion surveys) and asbestos surveying and monitoring. Mr. Schmid is a 2011 graduate from the University of New Hampshire, where he studied marine and freshwater biology, and environmental conservation. Prior to joining AKRF Mr. Schmid conducted fieldwork, water sampling and analysis in addition to assisting in a study of lakes in the North Eastern United States.

BACKGROUND

Education
BS Marine & Freshwater Biology, University of New Hampshire, Durham, NH

Licenses/Certifications
40 Hour OSHA HAZWOPER

30 Hour OSHA Construction Health and Safety

10 Hour OSHA Construction Health and Safety

NYS Asbestos Project Monitor, Air Sampling Technician, and Inspector

NYC Asbestos Investigator

Years of Experience
Year started in company: 2012
Year started in industry: 2011

References
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RELEVANT EXPERIENCE

New York City School Construction Authority (SCA), Environmental Consulting Hazardous Materials Services

AKRF has undertaken various assignments under two consecutive hazardous materials on-call contracts, including environmental assessment, remedial design, and plumbing disinfection consulting tasks. For potential new school sites, assignments include initial due diligence, Phase I environmental site assessments (ESAs) and multi-media subsurface investigation of soil, groundwater, and soil vapor to determine the suitability of a site for development as a school, likely remediation requirements, and associated costs. For sites undergoing design and development, assignments include preparation of remediation plans, design of sub-slab depressurization systems (SSDS) and contract specifications, and construction oversight. The work has also included conducting Phase I ESAs and indoor air quality testing, preparation of specifications, supervision of storage tank removals, and investigation and remediation of spills for existing schools. Due to the sensitivity of school sites, work under this contract is often conducted on short notice and during non-school hours. Mr. Schmid has performed and been involved in all of the above mentioned tasks.

Avalon Bay Communities, Avalon Yonkers Remediation and Redevelopment, Yonkers, NY

Mr. Schmid was the field lead during redevelopment efforts and implementation of the Remedial Action Work Plan (RAWP) and Site Management Plan (SMP), which included multiple phases of remediation for the former Halstead Quinn/ATI Tank Farm site and a former research and development (R&D) site, which was a New York State Department of Environmental Conservancy (NYSDEC) Brownfield redevelopment project along the Hudson River. Mr. Schmid was responsible for overseeing the installation and monitoring performance of the active sub-slab depressurization system, vapor barrier, groundwater treatment (dewatering) system, in situ soil stabilization (ISS) treatment of contamination beneath the water table and a slurry wall. Additionally Mr. Schmid oversaw the hot spot removal of contaminated soils, construction of NAPL recovery wells, UST removal and site-wide engineered cover systems. As the field leader Mr. Schmid was frequently in direct communication with NYSDEC regarding redevelopment and remedial activities at the site. Further, Mr. Schmid is responsible for assisting in the environmental reporting required with close-out of the remedial work.

New York City Department of Design & Construction (NYCDDC), East Side Coastal Resiliency (ESCR), New York, NY

AKRF was retained by the NYCDDC to provide a multi-disciplinary design for the protection of Lower Manhattan against another catastrophic hurricane. The project includes the collaboration of several professional consulting firms to design a resiliency system along the east side of Manhattan (from East 23rd Street down to Montgomery Street). The main components of the design include levees, berms, retaining walls, cut-off walls, and increasing the ground elevation to mitigate and limit surging flood waters from entering Lower Manhattan. A large portion of the project's subsurface has been impacted by manufactured gas plant (MGP)-related contamination. To support the

design and construction of the proposed flood protection structures and supporting utility conveyances, AKRF performed initial subsurface environmental investigations in 2015, and supplemental investigations in 2016, 2018, and 2019. The investigations included both public and private utility mark-out services across vast areas of the project containing critical infrastructure to enable the installation of 250+ borings and 30+ temporary groundwater wells. Mr. Schmid's responsibilities included assisting in the preparation of the Subsurface Investigation Work Plans, coordination between various subcontractors and agencies, and performing the associated field investigation activities including soil characterization and, soil and groundwater sampling. Following sampling activities Mr. Schmid oversaw the closure of boring holes in a manner that would ensure MGP related contamination was not further spread.

Willets Point, Queens, NY

AKRF supported the New York City Economic Development Corporation (EDC) with Phase 1 of the Willets Point Redevelopment Plan, which includes the demolition of existing structures. Mr. Schmid performed pre-demolition asbestos-containing materials and universal waste surveys of approximately 70 structures throughout the 23-acre area site in Queens along with an AKRF licensed NYC asbestos investigator.

Adelaar, Monticello, NY

The project is a multi-phase development consisting of approximately 1,700 acres. The project site has been developed with a mixed-use residential-commercial hotel, casino, water park and entertainment village. AKRF provided acquisition and development support, including performing Phase I and II environmental site assessments. Mr. Schmid provided assistance with Phase I assessments, oversight during remedial soil handling activities and conducted inspections in accordance with the Stormwater Pollution and Prevention Plans.

NYCHA Randolph Houses, W 114th Street, Harlem, NY

AKRF was directed to survey 14 five story affordable housing apartment buildings for potential asbestos containing materials prior to the renovation of the buildings. Mr. Schmid along with AKRF licensed NYC asbestos investigators performed the collection of bulk samples throughout the building's main floors, basements and roofs to confirm the presence of asbestos in some of the building materials.

250 North 10th Street, LLC., Residential Redevelopment Site, Brooklyn, NY

AKRF was retained to investigate and remediate this former industrial property in the Williamsburg section of Brooklyn, New York in connection with site redevelopment. The site is approximately 50,000 square feet, and redevelopment included a six story residential building and parking garage. The work was completed to satisfy the requirements of the NYC E-designation Program and NYC Voluntary Cleanup Program (NYC VCP). AKRF completed a Remedial Investigation (RI) to evaluate the nature and extent of site contamination, and developed a Remedial Action Work Plan (RAWP) to properly address site contamination during redevelopment. Remediation included removal of underground storage tanks, more than 7,500 tons of contaminated soil, and installation of a vapor barrier and site cap across the entire property. The remediation was completed under oversight of the NYC Office of Environmental Remediation (OER), and in a manner that has rendered the Site protective of public health and the environment consistent with residential use of the property. Mr. Schmid conducted construction oversight and community air monitoring during the removal of contaminated soil.

JOHN SULICH, EIT

JUNIOR ENVIRONMENTAL SCIENTIST

John Sulich is an environmental engineer in AKRF's Site Assessment and Remediation group with experience conducting soil, groundwater, and soil vapor sampling, and environmental remediation monitoring and oversight. Mr. Sulich also prepares daily monitoring reports and other technical documentation.

BACKGROUND

Education
B.S., Environmental Engineering, Cornell University, December 2017

Certifications
New York State Engineer-in-Training
OSHA 40-hour Hazardous Waste Operations and Emergency Response Training
OSHA 10-hour Construction Safety Training
OSHA 30-hour Construction Safety Training

Years of experience
AKRF: June 2017- March 2018 (internship); June 2018 - present (full time)
Prior industry experience: Intern at Hygenix Inc., Stamford, CT (Summer 2016)

References

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Saritha Thumma, Project Manager
NYC School Construction Authority
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RELEVANT EXPERIENCE

Church-Division Street – Tower A, New Rochelle, NY

Mr. Sulich was responsible for implementation of the RAWP during excavation and foundation construction between October 2019 and February 2020. Environmental monitoring included overseeing soil management, conducting community air monitoring, and preparing daily reports for submittal to the AKRF and NYSDEC project managers. Mr. Sulich also assisted in preparation of the Interim Remedial Measure Construction Completion Report and Final Engineering Report to document the RAWP implementation.

Former Polychrome Sites, AvalonBay, Yonkers, NY – Remediation Oversight

The former Polychrome R & D and Manufacturing sites are two adjacent NYSDEC Brownfield redevelopment projects along the Hudson River. Mr. Sulich served as an on-site environmental monitor during on-going remediation of the sites. In this role, Mr. Sulich conducted community and work zone air monitoring, directed excavation of hot-spot soil removal areas, oversaw truck loading and off-site disposal of contaminated soil, and evaluated test cores for quality control of in-situ soil stabilization (ISS).

Former Halstead Quinn/ATI Tank Farm Redevelopment Site, Yonkers, NY – Environmental Monitoring

Mr. Sulich served as an on-site environmental monitor during implementation of the Site Management Plan (SMP) at the Former Halstead Quinn/ATI Tank Farm Site, a NYSDEC Brownfield redevelopment project along the Hudson River. In this role, Mr. Sulich conducted community and work zone air monitoring, directed oversaw off-site disposal of soil excavated for building construction/site work, and inspected vapor barrier and sub-slab depressurization system installation progress.

Larkin Plaza, Yonkers, NY – Remediation Oversight

AKRF performed a Remedial Investigation (RI); prepared an application to enroll the property into the NYSDEC BCP; and, after enrollment, prepared a Remedial Action Work Plan (RAWP). Mr. Sulich served as an on-site environmental monitor during site remediation to ensure compliance with the RAWP, which included community and work zone air monitoring, and overseeing excavation and export of contaminated soil.

Proposed Hamilton Green Mixed-Use Development, White Plains, NY – Subsurface (Phase II) Investigation

As part of the State Environmental Quality Review Act (SEQRA) requirements for this proposed development in downtown White Plains, AKRF prepared an Phase I Environmental Site Assessment (ESA) and conducted a Subsurface (Phase II) Investigation to evaluate potential subsurface contamination at the Site. Mr. Sulich assisted with soil, groundwater and soil vapor sampling during the Phase II investigation and prepared soil boring and groundwater sampling logs for incorporation into the Phase II report.

Proposed Amy's Kitchen Processing Plant, Goshen, NY – Limited Subsurface (Phase II) Investigation

As part of the State Environmental Quality Review Act (SEQRA) requirements for this project in Orange County, AKRF prepared an Phase I Environmental Site Assessments (ESA) and completed Limited Subsurface (Phase II) Investigations to evaluate potential subsurface contamination at the sites of a proposed food processing plant and associated utility corridor. Mr. Sulich assisted with soil and groundwater sampling during the Phase II investigation along the utility corridor, and developed soil boring and groundwater sampling logs for incorporation in the Phase II report.

87 Gedney Way, White Plains, NY – Groundwater Monitoring

AKRF was hired by the City of White Plains' Department of Public Works (DPW) to prepare and implement a landfill closure plan for the 22.7-acre Gedney Way Leaf and Yard Waste Compost Facility. Landfill closure activities have been completed and NYSDEC closure approval is pending. As part of post-closure monitoring, Mr. Sulich screened wells for methane, measured depth to groundwater, and collected groundwater samples using low-flow sampling methods.

Home Depot Rego Park, Queens, NY – Groundwater Monitoring

AKRF has designed, installed and performed upgrades to an air sparging and soil vapor extraction system being used to remediate tetrachloroethene contamination in groundwater at this site under the NYSDEC Voluntary Cleanup Program. Mr. Sulich performed low-flow groundwater sampling as part of quarterly monitoring activities to assess the progress of the cleanup.

Hygenix Inc., Stamford, Connecticut – Environmental Intern

As an environmental intern at Hygenix, Mr. Sulich assisted with environmental testing and monitoring for asbestos and lead; reviewed asbestos, lead, mold, and PCB survey and clearance reports; and wrote proposals for large-scale asbestos inspections, resulting in two new contract awards