



REMEDIAL INVESTIGATION WORK PLAN

Lovric's Sea-Craft
3100 Oakes Avenue
Anacortes, Washington 98221
Facility Site ID #21847524

Prepared For:

Guemes Channel Holdings, LLC

By:



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January 15, 2025

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ACRONYMS & ABBREVIATIONS

AST	Above ground storage tank
COC	Contaminant of concern
CSM	Conceptual site model
CUL	Cleanup level
DAHP	Washington Department of Archaeology and Historic Preservation
DMMP	Dredge Material Management Program
EIM	Environmental information management system
GCH	Guemes Channel Holdings LLC
GPR	Ground penetrating radar
HASP	Health and Safety Plan
HCID	Hydrocarbon identification
IDP	Inadvertant Discovery Plan
MarVac	Marine Vacuum Services, Inc.
MDL	Method detection limit
MTCA	Model Toxics Control Act
PAHs	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyl
PID	Photoionization detector
Property	Parcels of real property that are included in the Site area
QAPP	Quality Assurance Project Plan
REC	Recognized environmetnal condition
RL	Reporting limit
RPD	Relative percent difference
SAP	Sampling & Analysis Plan
Site	Area of known or suspected contamination at Lovric's Sea Craft (3100 Oakes Avenue in Anacortes, WA)
SMI	Stabbert Maritime & Industrial, Inc.
sVOC	Semi-volatile organic compound
TBT	Tributyltin
TCLP	Toxics Characteristic Leaching Protocal
TEE	Terrestrial Ecological Evaluation
USACE	United Stated Army Corps of Engineers
UST	Underground storage tank
VI	Vapor intrusion
VOC	Volatile organic compound
WAC	Washington Administrative Code



January 15, 2025

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Re: Remedial Investigation Work Plan

Lovric's Sea-Craft
3100 Oakes Avenue
Anacortes, Washington 98221
Facility Site ID #21847524

Dear Ms. Allison:

This document presents a work plan to evaluate the upland portion of the Lovric's Sea-Craft Site (Site) in Anacortes, Washington. The goal of the remedial investigation work plan is to fill in data gaps associated with soil and groundwater quality and to characterize the nature and extent of contamination originating on and from the Site. This proposed investigation is designed to comply with the state cleanup requirements under the Washington Department of Ecology's Model Toxics Control Act (MTCA) for compliance with the necessary elements for a Remedial Investigation (WAC 173-340-350(7)).

This work plan addresses the upland portions of the Site. Due to proposed plans for dredging of the submerged portions of the Site, characterization and remediation of sediments will be addressed in a supplemental work plan once details of the proposed dredging have been finalized.

Should you have any questions concerning this work plan, please do not hesitate to contact us at (360) 714-9409.

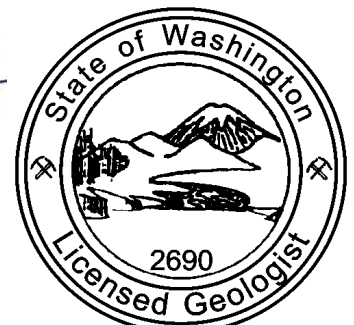
Sincerely,
Stratum Group


Ben Carlson, M.Sc., L.G.
Licensed Geologist



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KIM N NINNEMANN

1.0 INTRODUCTION

Stratum Group has prepared this remedial investigation work plan for the Lovric's Sea-Craft Site (Site) located at 3100 Oakes Avenue in Anacortes, Washington (Property). The Property is defined as the parcels of real property involved in the project. The Site is defined by the area of known or potential environmental contamination on the Property. This work plan outlines the recommended steps to conduct a remedial investigation on the upland portion of the Site.

The purpose of this investigation is to characterize the surface soil, subsurface soil, and groundwater conditions on the upland portion of the Site. The information gained from the proposed site characterization sampling will help establish and/or eliminate areas of environmental concern on the Site and inform future remediation and goals to modernize the shipyard facilities at the Site.

The Site is located along the southern shore of Guemes Channel, a broad tidal channel of the Salish Sea between Fidalgo and Guemes Islands. Portions of the Anacortes shoreline, including along the Property, have been utilized for industrial purposes since the late 19th century. A glue factory was initially built on the Property in 1890, which was followed by a fish cannery in the mid-1910s that operated through the early 1960s. The Property converted to ship repair and moorage activities in the mid-1960s and has operated as an active shipyard since that time.

The Site is listed as a former underground storage tank (UST) site and a cleanup site (Facility Site ID # 21847524, Cleanup Site ID # 14900, [Site webpage](#)) by the Washington State Department of Ecology (Ecology). Two fuel oil USTs were removed from the Site in 1997, with no significant contamination concerns reported at that time. The Site became a listed contaminated site in 2019 due to the discovery of contaminated sediments within the commercial harbor area in 2017.

Plans for dredging the Lovric's harbor area are currently being developed by Guemes Channel Holdings LLC (GCH), the property owner. Characterization of site sediments will be integral to the development of the final dredging plan and determining management of dredge spoils. Therefore, we recommend that characterization and remediation of sediments in submerged portions of the Site be addressed in a separate work plan to be developed with Ecology in coordination with the dredging proposal.

Numerous interim sampling events and cleanup actions have taken place on the Site since 2022. This work plan was developed to address data gaps in surface soil, subsurface soil, and shallow groundwater, particularly in areas where historical fill, industrial operations, and visual observations indicate potential presence of contamination.

This work plan includes a summary of previous sampling and remedial action work, identification of data gaps, a summary of interim actions that have been completed by GCH since their acquisition, and recommendations for additional environmental investigation including a



sampling and analysis plan (SAP) and quality assurance plan (QAPP). This work plan will be submitted to Ecology for their review and approval under Agreed Order No. DE 22368.

2.0 BACKGROUND

2.1 Property Location

The Property is located within the city limits of Anacortes, Washington in Skagit County. The Property is located on the north shore of Fidalgo Island approximately 1.4 miles west-southwest of the historical downtown core of Anacortes, between Dakota Avenue to the east and Hartford Avenue to the west. The Property business utilizes the street address 3100 Oakes Avenue. Tax parcel records indicate the Property also utilizes the addresses 3006 Oakes Avenue, 3022 Oakes Avenue, and 1100 Dakota Avenue. The location of the Property is presented in Figure 1-1 in Appendix I.

The Property consists of ten tax parcels that cover approximately 8.7 acres, portions of which are submerged below the high-water mark of Guemes Channel to the north. The upland consists of a steep vegetated hillside and a relatively level shoreline commercial area that is developed with multiple buildings and marine railways. The elevation of the Property along Oakes Avenue is approximately 70 feet above mean sea level, with a steep 50-to-60-foot elevation drop to the nearshore and shoreline areas where the shipyard infrastructure development is present.

2.2 Key Site Features

A variety of structures are located on the Site which were constructed over a period of time by prior owners to facilitate site uses including fish processing, a shipyard, and a marina.

Structures and key physical elements of the Site include the following:

- **West Breakwater** – A west breakwater consisting of upland fill with rip rap slopes. A portion of the breakwater was created from a large ship known as the La Merced that was beached in the 1960s and backfilled with fill material. The outer portion of the breakwater was created from a barge backfilled with fill material. The West Breakwater was constructed in the mid to late 1960s.
- **Recreational Marina** – A small to medium-sized boat marina with 40 slips able to accommodate boats ranging between 26' and 70' in length. The recreational marina consists of floating docks and anchor pilings surrounded by rip rap shoreline. The Marina area was dredged, and floats were constructed in the mid to late 1960s following the installation of the West Breakwater.
- **Bulkheads** – Various timber, rip rap, and concrete bulkheads exist along the shoreline. These include the West Warehouse Bulkhead, Marine Railway Bulkheads, and East Warehouse Bulkhead.
- **West Peninsula** – A west peninsula consisting of upland fill with rip rap slopes is located



Remedial Investigation Work Plan – Upland Areas

to the east of the small boat marina and the west of the central peninsula and west warehouse. This area was created from a large barge backfilled with fill material. The West Peninsula was created in the early to mid-1960s.

- **Center Peninsula and Pier** – A center peninsula and pile-supported pier consisting of an upland area with rip rap slopes on the nearshore end and a concrete and timber-pile supported pier structure at the outer end. The existing land portion of the central peninsula is approximately 205 feet long and 50 feet wide. The center peninsula includes a large barge that was backfilled with unknown fill material in between the rip rap slopes. The existing timber pile-supported central pier is approximately 26 feet wide and 105 feet long. The timber pier structure is in deteriorated condition. Approximately nine older concrete pilings were used to repair the timber pier in the past. The Center Peninsula and Pier appear to have been constructed in the late 1960s.
- **Marine Railway Facility** – Two marine railways consisting of steel rails supported by timber piling, which may be set on timber piles, concrete footings or gravel base. The marine railways are used to haul out and work on ships. The area around the perimeter of the railway facility consists of soil, rip rap, and concrete bulkheads. The center area between the two railways consists of a shed built on an old barge that was beached and left to decay in place. The small (west) railway was built in the mid-1960s, and the large (east) railway was built in the mid to late 1930s.
- **East Pier** – An east pier constructed in the early to mid-1990s of timber pilings and timber superstructure with a concrete deck. The east pier varies in width and is approximately 315 feet long. The east pier is in deteriorated condition.
- **Floating Pontoon Breakwater** – The east pier connects via a vehicle gangway steel ramp to an outer concrete-pontoon floating moorage and breakwater system placed on the property in the early to mid-1990s. The floating concrete pontoon system is in good condition. The pontoon system is anchored to piles and anchors via a chain system.
- **Commercial Marina** – The water area of the facility around the floating pontoons, east pier, central pier, and marine railway facility that is used for maneuvering and moorage of vessels within the shipyard facility.
- **Parking and Equipment Storage** – There is an existing asphalt roadway from Oakes Avenue down the west side of the property. The roadway transitions from asphalt to gravel as it moves from west to east. Gravel and soil areas on the site are utilized for vehicle parking and equipment storage.
- **West Warehouse** – A three story wood framed building built in approximately 1913 and totaling approximately 21,000 square feet is located on the west side of the property. The West Warehouse was constructed on a pile foundation that has been backfilled behind the bulkhead wall.
- **East Warehouse** – A four story wood frame building built in approximately 1962 and totaling approximately 34,000 square feet. The building is constructed on a pile foundation with reinforced concrete pile caps.
- **Tin Building** – A two-story wood-framed building of approximately 4,300 square feet. The building is sided with metal corrugated panel siding and constructed with concrete footings and slab.



- **Utilities** – The site has limited utility infrastructure. Due to the age of the facility, it has no sewer or storm water management system. In addition, the power infrastructure is insufficient to provide commercial vessels with adequate shore power and support modern shipyard activities.

The Property is bordered by single-family residential properties to the south along Oakes Avenue, undeveloped land to the east and west, and Guemes Channel to the north.

According to the City of Anacortes, the Property is mostly zoned as Light Manufacturing (LM). However, the bluff top area along Oakes Avenue is zoned as Residential Low Density 2A (R2A). Most of the Property falls within the Urban Shoreline Designation, while the west end of the Site falls within the Conservancy Shoreline Designation.

An annotated aerial photograph of the Property and vicinity is provided in Figure 1-2 in Appendix I. A larger-scale aerial photograph with key site features labeled is provided in Figure 1-3 in Appendix I.

2.3 Development and Use History

The Property has been developed since at least the late 1890s, when the Russian Cement plant was constructed. This business included the existing structures on the eastern side of the Property, as well as a few docks and other structures that are no longer present. The business produced glue, fertilizer, and fish oil from fish waste gathered from nearby canneries.

Robinson Fisheries established a cod cannery on the west side of the Property circa 1912, which included the existing west warehouse building and several other structures and docks that are no longer present, including additional warehouse or commercial buildings that were built out on docks over Guemes Channel. The entire Property is believed to have operated as a fish processing facility through the mid-1960s.

Lovric's Sea-Craft shipyard was established on the Property by 1965. One of the remaining former docks, extending north from the west warehouse building, was removed by 1969. Shipyard activities are apparent on the Property by 1969, including the presence of two marine railways in roughly their present locations. Two old ships were beached within Guemes Channel along the western edge of the Property in the late 1960s to serve as a breakwater to provide protected boat moorage on the Property. Multiple additional docks were built on the Property and heavier industrial use with extensive exterior storage is visible by the mid-1970s. Two ships or barges that would later be filled to create additional work area near the west warehouse building are evident by the mid-1970s. Significant filling of the waterfront areas of the Property occurred in the late 1970s and 1980s to create many of the existing flat areas surrounding the two main warehouses. The fill reportedly consists of a mix of marine dredge spoils and upland-derived fill. The existing docks were constructed in their present arrangement by 1998. The Property has been in continuous operation as a boat shipyard since the mid-1960s.



The Property was owned and operated by the Lovric family from the late 1960s through early 2023. GCH purchased the Property in February 2023 and leased the Property to Stabbert Marine & Industrial (SMI), an affiliated entity, for expansion of its existing shipyard operations.

2.4 Geology and Soils

The following descriptions of the surficial deposits in the vicinity of the Property were interpreted from the *Geologic Map of the Bellingham 1:100,000 Quadrangle, Washington* (Lapen, 2000). Lapen maps the upland portion of the Property as being underlain by surficial deposits of Vashon till (Qgt). Vashon till consists of an unsorted, unstratified mix of clay, silt, sand, and gravel deposited beneath and subsequently overridden by glacial ice. This results in a well compacted and relatively low permeability unit. Continental-derived sediment deposits including sand, silt and clay with lesser gravel and peat of the Whidbey Formation (Qcw) are mapped as lying below the till. These two geologic units are suspected to compose the majority of the shoreline bluff on the southern edge of the property.

Our interpretations of historical aerial imagery of the vicinity indicates that much of the land area north of the access road that runs along the base of the shoreline bluff consists of fill material imported to produce the existing breakwater, jetties, and ship repair areas. Fill material likely consists of a mix of dredge spoils from the harbor area (unconsolidated sand, silt and clay) and man-made debris. Fill material of this kind is typically loose and can range from low to high permeability.

Soils observed in environmental borings completed near the shoreline on the Property in August 2022 consisted of fill composed of silty gravel to silty sand with gravel between 2 and 7 feet thick. No significant debris was noted in the fill materials. Subsequent to acquisition of the Property, GCH discovered significant creosote piling debris predominately buried within fill to the south of the recreational marina, which was removed and disposed of as solid waste.

Fill material is underlain by a few feet of nearshore sand and slightly silty sand deposits that transition into glaciomarine or glaciolacustrine deposits of fine silty sand to silt and sandy silt to depths of at least 50 feet bgs.

2.5 Hydrology

Guemes Channel, a waterway of the Salish Sea, bounds the Property to the north. No other natural surface water features are present on the Property.

Stormwater on the Property directly infiltrates into the subsurface or flows off the surface towards Guemes Channel. A City of Anacortes municipal stormwater outfall is located on the Property, just east of the base of the east driveway (Dakota Avenue). No stormwater from the Property is collected and discharged through this outfall pipe.

Additionally, two steel hanging pipes that carry surface water and/or stormwater collected from



offsite exit a slope on the southwest corner of the Property and discharge onto the slope below. The drainage then flows into another underground pipe and discharges into Guemes Channel west of the existing breakwater.

The direction of shallow groundwater flow is generally a function of topography and proximity to surface water features. The Property is located on topography that slopes gently to steeply to the north toward Guemes Channel.

Previous subsurface investigations on the Property identified groundwater at approximately 8 feet below the ground surface (bgs) in the low-lying nearshore area where shipyard activities are ongoing. Based on the proximity to Guemes Channel, groundwater depth and flow direction on this portion of the Property is likely tidally influenced. Additionally, groundwater is likely to be present at greater depths on the higher elevation portions of the Property. Water has been periodically observed flowing across gravel areas near the base of the shoreline bluff, which may be indicative of groundwater seeps flowing out of the hillside. The temporal variability of the presence of these seeps has not been established.

Based upon our review of Ecology's Well Construction & Licensing database, no drinking water wells are present on the Property or in the immediate vicinity. Drinking water is provided to the Property and nearby properties by the City of Anacortes, which pipes water from the Skagit River. According to Ecology's database, the nearest domestic well(s) to the subject property are located approximately 1.4 miles southeast. None of the wells have Ecology well tag IDs. Available information about these wells is provided in Table 1, below. Other domestic wells may be nearer to the subject property but are located on Guemes Island and are hydrologically separated from the subject property by Guemes Channel.

Table 1. Nearby Domestic Water Wells

Well Owner	Well Location	Date Drilled	Drilled Depth (ft)	Water Depth (ft)
Charles Whitney	T35N R1E SEC25, SW1/4 of the NE1/4 (vic of 3317 H Ave)	06/06/1985	76	42
W.E. Morris	2307 37 th St, Anacortes	11/13/1975	77	45
Will Moffet	3305 H Ave, Anacortes	05/27/1982	58	20(?)

3.0 SUMMARY OF PREVIOUS INVESTIGATIONS

Multiple environmental investigations have been completed on the Lovric's Site, dating back to 1997. Key findings from those investigations are summarized below.



3.1 UST Site Assessment – Pinner Engineering (1997)

Two concrete vault USTs, each approximately 10,000 gallons in volume, were located north of the east warehouse building, based on a hand-drawn Site map contained within the 1997 report. The USTs were reportedly used to store heating oil or bunker oil.

No groundwater was encountered in the tank pit up to nine feet below the ground surface (bgs) at the time of tank removal. A total of six soil samples were collected from the UST excavation and analyzed for diesel-range petroleum. One of the samples exceeded the cleanup standard for diesel-range petroleum (560 mg/kg), which was 200 mg/kg at the time of the report; however, all the detections meet the current MTCA Method A cleanup standards for diesel- and oil-range petroleum of 2,000 mg/kg. Only one of the samples was analyzed for heavy oil-range petroleum, which is the primary contaminant of concern given the suspected historical tank contents. Oil was detected in that sample at a concentration higher than the concentration of diesel but below the current cleanup standard of 2,000 mg/kg. No further investigation or remediation work was performed with regard to the USTs or surrounding soil.

3.2 Sediment Data Report – Whatcom Environmental Services (2019)

Ecology required the former property owners to conduct sediment sampling in the submerged portions of the Site to determine whether historic and ongoing operations had contaminated nearshore sediments. Whatcom Environmental collected samples in September 2017 in accordance with an Ecology approved sampling and analysis plan. A total of 13 samples were collected in a grid pattern extending up to approximately 200 feet into the water north of the shoreline from the marine railways and east warehouse. Samples were collected from the upper 10cm of sediment accumulated on the seafloor. The thickness of accumulated loose sediment within the harbor was not evaluated as part of this investigation.

One or more of the samples exceeded the selected screening concentrations for copper, zinc, tributyltin, benzoic acid, phthalates, and/or polycyclic aromatic hydrocarbons (PAHs). Based upon these results, Ecology deemed that remedial action to address sediment contamination was necessary. Ecology listed the Site as a confirmed cleanup site in February 2019 due to the contaminated sediments. Lovric's Sea-Craft Inc., the prior owner, was identified as a potentially liable party for the release.

3.3 Environmental Site Assessment: Phase I – Stratum Group (2021)

Stratum Group prepared a Phase I ESA for the Site dated September 29, 2021 at the request of Holmes, Weddle & Barcott PC, who to our knowledge was representing Lovric's Sea Craft, the former property owner. Based upon historical research, interviews of personnel, and observations made during a site visit, several recognized environmental conditions (RECs) were identified that warranted further investigation:

- Dark staining of surface soils due to leaks of hydraulic fluid and/or oil from heavy



equipment was observed around the outside of the east warehouse building.

- Potential discharge of hazardous wash water or improper dumping of hazardous substances into a utility sink believed to discharge to the ground underneath the west warehouse.
- Potential leaks of hazardous substances from dozens of drums and smaller containers, especially inside the east portion of the east warehouse and the paint storage shed by the west warehouse.
- A metal pipe rising up the side of a dilapidated shack indicated a possible old heating oil UST.
- Potential metals contamination of shallow soils associated with long term storage and weathering of equipment and metal scrap.

Stratum Group also reviewed documentation of previous environmental work completed on the Site (see Section 3.1 and 3.2) and identified two additional RECs:

- Suspected residual petroleum contamination associated with two former ~10,000-gallon oil USTs.
- The listing of the Site (Cleanup Site ID # 14900) due to elevated concentrations of copper, zinc, mercury, tributyltin, benzoic acid, phthalates, and PAHs in marine sediments.

Additional details associated with these RECs, as well as copies of previous environmental investigation reports discussed above are provided in the Phase I report.

3.4 Limited Phase II Environmental Sampling Investigation (2022)

As part of feasibility planning, and prior to the sale of the Site to GCH, Stratum Group was engaged by GCH to conduct environmental sampling to investigate the areas of potential environmental concern identified in the Phase I ESA. Environmental sampling was completed in cooperation with a geotechnical investigation directed by others. Details of the sampling investigation are provided in a report titled *Environmental Site Assessment: Limited Phase II* dated September 29, 2022.

Prior to drilling activities, a ground penetrating radar (GPR) survey and a private utility locate were completed in the vicinity of the proposed sampling locations. No anomalies consistent with USTs, underground equipment, or underground utilities were identified in the proposed boring locations.

A total of nine borings were drilled using a hollow stem auger. Split spoon sampling techniques were used to collect soil as part of the combined geotechnical and environmental investigation. Borings were completed to depths that ranged from 21.5 and 55 feet bgs. Four of the boring locations were selected primarily due to environmental concerns, including adjacent to the former oil USTs (SG-1), west of the east warehouse in areas of observed surface petroleum leaks



and suspected fill placement (SG-2), adjacent to a suspected heating oil tank by a vacant shack (SG-3), and adjacent to a utility sink in the west warehouse where improper dumping and disposal practices were suspected (SG-4).

The remainder of the boring locations were chosen based upon geotechnical needs. Soil from these other boring locations was not directly observed or sampled for environmental purposes. However, field observations relayed from the field geotechnical engineer to Stratum Group personnel indicated that they had not observed any obvious evidence of contamination in those borings and that subsurface soils looked similar to those encountered in other locations (i.e., fill overlying glacial sediments).

Soil and reconnaissance groundwater samples were collected from four boring locations. Based on the suspected contaminants of concern at each location, samples were analyzed for diesel- and oil-range petroleum hydrocarbons, metals, carcinogenic PAHs, a suite of semi-volatile organic compounds (SVOCs) and/or a suite of volatile organic compounds (VOCs). Contaminant concentrations were compared to MTCA Method A cleanup levels for unrestricted land use for screening purposes.

Indications of petroleum contamination were observed in fill material from SG-1. Additionally, scattered human-derived debris (e.g., glass, brick, metal) was observed in fill material between approximately 2 and 7 feet bgs in each of the four environmental borings. No other obvious field indications of contamination such as odors, discoloration, or sheens were observed in the environmental borings. Communications with the field representative of the geotechnical consultant overseeing the other five borings not directly overseen by Stratum Group personnel indicated that (1) fill thickness was similar to what we observed across the Site and, (2) no obvious indications of contamination were observed in the geotechnical borings.

Petroleum contamination was identified in the shallow soil and groundwater in the vicinity of the former UST area (SG-1). Although the USTs appear to have been removed, results from Stratum Group's investigation indicate that residual soil contamination remains in the former UST area. Petroleum contaminated groundwater identified in this location is likely associated with the historical releases from the USTs, with contaminated soils likely acting as an ongoing source of contamination. An above ground waste oil storage tank was also stored in the vicinity of the former USTs until recently and may have acted as a source of petroleum contamination in this area. No petroleum contamination was found in the soil sample from 7.5 feet in presumed native nearshore sediments, which indicates that the soil impacts are located within the fill material. The lateral extent of petroleum contaminated soil and groundwater around the former underground tanks was not determined.

Petroleum contamination in the previously identified spill area (SG-2) is primarily limited to shallow soils, consistent with the likely source being surface spills. The source of diesel contamination in groundwater in this location, which only marginally exceeds the unrestricted land use cleanup concentration, has not been confirmed. Given the low to non-detect petroleum



concentrations in soil at 5 and 10 feet bgs, the location of the boring may not be in the spill area that caused interaction with the groundwater, or infiltrating surface water may be interacting with contaminated shallow soils as it percolates through the soil column. Additional sampling will be needed to characterize the petroleum contamination in this area.

Arsenic, mercury, lead, and/or cPAHs were present in shallow fill soils in two locations (SG-1 and SG-2). Metals are suspected to be present in the shallow fill soils due to long-term weathering of scrap metal and equipment on the Site. With this source, the impacts are shallow and present in suspected storage areas. Some of the metals may be associated with used oil, in association with the oil staining beneath equipment.

Elevated cPAH concentrations were identified in deeper fill and/or native soils from two locations (SG-2 and SG-4). The source of deeper cPAH contamination on the Site is unclear and concentrations were not consistent throughout the Site. Sources of cPAHs may correspond to isolated hot spots of fill material, or possibly pre-1960s industrial activities (e.g., fish canneries, glue factories) that operated before placement of the existing fill.

After laboratory filtration to remove excessive particulate matter, groundwater from most sampling locations met screening levels for metals and cPAHs. However, arsenic concentrations remained above the drinking water screening level in SG-2 and SG-3 after laboratory filtration. The source of arsenic in groundwater is not clear, particularly since groundwater is not in regular interaction with the shallow fill material where elevated arsenic concentrations were detected in soil. Elevated arsenic in groundwater may, instead, be reflective of naturally occurring arsenic derived from local geologic conditions. Additional evaluation may be warranted to (1) collect samples more representative of actual groundwater conditions from permanent monitoring wells and (2) determine background arsenic concentrations in local groundwater.

Maps showing the location of sample collection and the results of soil and groundwater sample analysis from this investigation are provided in Figures 2-1, 2-2, and 2-3 in Appendix II.

The report concluded that further action was warranted on the Site to define the extent of contamination and determine the most appropriate cleanup standards for the Site based on current and future use. The report indicated that contamination identified in the investigation did not pose an immediate danger to persons working on the Site and would not have a functional impact to property use as long as desired uses remain industrial. The report noted that due to the extensive fill material across the Site, soils disturbed for development purposes should be sampled by an environmental professional for characterization to determine whether special disposal methods are required.

3.5 Limited Sediment Sampling Investigation (2023)

Following GCH's acquisition of the Site in early 2023, additional feasibility studies were undertaken by GCH as part of planning for modernization of the Site. It is Stratum Group's understanding that modernization plans for the Site include replacement of the existing east pier



that is used to access the floating pontoon docks.

To determine geotechnical design parameters for the new pier, two borings were completed through submerged sediments underneath the existing pier using mud-rotary drilling techniques and a split spoon sampler. Stratum Group was engaged to observe the drilling activities to look for indications of contamination and collect sediment samples for proposed dredge characterization purposes. A formal report documenting these activities has not been prepared. However, a summary of this limited sediment sampling investigation is provided below with supporting documentation presented in Appendix III.

Borings were completed on April 24 and 25, 2023. The sediment was accessed from the east pier by removing concrete panels in the deck of the pier. Steel casing was then lowered through the hole in the pier by a drill rig to the seafloor and driven into the sediment to allow drilling and sediment sampling to progress. The locations of the two borings are indicated on Figure 3-1 in Appendix III. Borings are labeled PG-1 (outer) and PG-2 (inner), for reference.

Soil samples were collected using standard penetration test (SPT) sampling techniques to drive a modified California split spoon sampler with a 2.5" inner diameter, to allow for sufficient sample volume for the necessary analyses.

3.5.1 Sediment Samples

Sediment encountered in the two pier borings consisted of gray, interbedded silt, sandy silt, and silty fine sand to at least 50 feet below the sea floor. Soft/loose sediment was only present in the upper ~0.5 foot of the outer pier boring (PG-1) while soft/loose sediment made up the upper 5 feet of the soil column in the inner pier boring (PG-2). Trace shells and bits of wood were observed in the upper 1 to 2 feet of the soil column. These findings are consistent with observed stronger currents farther away from the shore, which likely prevents significant deposition of the fine sediments on this portion of the seafloor. However, as current strength decreases closer to shore, sediment deposition correspondingly increases.

Samples from PG-1 were collected from the surface of the seafloor (0-0.5 feet bgs), 6-6.5 feet bgs, 11.5-12 feet bgs, and 20-20.5 feet bgs. Samples from PG-2 were collected from the surface of the seafloor (0 feet bgs) and 10 feet bgs. No obvious indications of contamination were observed in sediment from either pier boring. After collection, samples were immediately placed into an ice-filled cooler and transported to an Ecology-accredited laboratory for analysis.

Sediment samples were analyzed for the full suite of chemicals of concern (COCs) for marine environments outlined in Table 8-3 of the U.S. Army Corps of Engineers (USACE) Dredged Material Evaluation and Disposal Procedures manual. Samples were also analyzed for the sediment conventional parameters described in Table 8-1 of the manual. The deepest sample from each location was selected to be below the anticipated maximum depth of proposed dredging ("Z-layer"), based upon preliminary dredging plans provided to Stratum Group at the time of sampling.



Photographs from the sediment sampling work are provided in Appendix III.

A summary of the sediment analysis results is presented in Table 3-1 in Appendix III. Maps with the sediment sample locations and analytical results are provided as Figures 3-1, 3-2, and 3-3 in Appendix III. A complete copy of the analytical laboratory report and chain-of-custody are provided in Appendix III. Most of the analysis was completed by Friedman & Bruya Laboratory of Seattle, Washington. Grain size and total organic carbon analyses were subcontracted to Fremont Analytical of Seattle, Washington. Ammonia, sulfides, and tributyltin analyses were subcontracted to Analytical Resources, LLC of Tukwila, Washington. All laboratories are accredited with Ecology.

3.5.2 Sediment Sample Results Discussion

Sediment from four of the five samples met the screening levels for all COCs. Although several of the COCs were detected, all detections were well below their respective CULs.

Sediment in sample PG2-0 contained elevated concentrations of naphthalene and dibenzofuran. Naphthalene was detected at 4.7 mg/kg, above both the screening level concentration of 2.1 mg/kg and the maximum level of 2.4 mg/kg. Dibenzofuran was detected at 0.79 mg/kg, above the screening level concentration of 0.54 mg/kg but well below the maximum level of 1.7 mg/kg. Based upon these results, the majority of sediment in the vicinity of borings PG-1 and PG-2 underneath the east pier should be suitable for unconfined, open-water disposal at any USACE Dredge Material Management Program (DMMP) marine site. However, shallow loose sediment accumulated nearer to the shore beneath the pier may require additional testing to determine suitable disposal options.

We anticipate that upon completion of a final or near-final dredging plan and prior to initiation of dredging activities, additional sediment sampling will be required to complete disposal characterization of dredge material throughout the rest of the proposed dredge area.

4.0 INTERIM REMEDIAL ACTIONS

Since GCH acquired the Site in February 2023, they have conducted multiple interim remedial actions.

4.1 Fill Soil Removal (2023)

Soon after acquisition of the Property, GCH engaged Stratum Group to characterize a large pile of fill material that had been stockpiled by the previous property owners. A formal report documenting these activities has not been prepared. However, a summary of work to characterize and dispose of this soil stockpile is provided below with supporting documentation presented in Appendix IV.



Stratum Group visited the Site on March 30, 2023 to observe the soil pile and collect representative soil samples. The stockpiled soil was located to the west of the east warehouse and adjacent to the bulkhead (see Figure 1-3, Appendix I). By that time, GCH had begun to remove tires, creosote timbers, and other large debris from the pile for separate disposal. GCH had also excavated an additional 2 to 3 feet below the surrounding grade on the west side of the stockpile, which had been added to the stockpile for eventual removal. When excavation was not active, the soil pile was covered with plastic sheeting.

Stratum Group estimated the volume of soil planned for removal to be approximately 300 cubic yards. We compared this estimated volume to Table 6.9 (Typical Number of Samples Needed to Adequately Characterize Stockpiled Soil) in Ecology's *Guidance for Remediation of Petroleum Contaminated Sites* (Ecology, 2016) and determined that a minimum of five soil samples should be collected from the stockpile for characterization purposes.

4.1.1 Soil Samples

Stratum Group collected five soil samples from the stockpile on March 30, 2023, one from each side of the pile and one from the top of the pile. The approximate locations of each sample are provided on Figure 4-1 in Appendix IV. Samples were collected using hand tools by digging at least 6 inches back into the stockpile, and then filling one laboratory-supplied 4oz soil jar. Photos of the soil pile and the sampling locations are provided in Appendix IV.

Sample SS-1 was collected from the northeast side of the stockpile. Soil from the sample area consisted of brown silty sand with gravel with some blackened pieces of wood and trace metal debris.

Sample SS-2 was collected from the northwest side of the stockpile. Soil from the sample area consisted of brown to red-brown silty sand with gravel along with trace wood debris, metal debris, and bits of Styrofoam.

Sample SS-3 was collected from the top center of the stockpile. Soil from the sample area consisted of brown to red-brown silty sand with gravel along with trace wood, charcoal, metal debris, and bits of plastic and Styrofoam.

Sample SS-4 was collected from the southwest side of the stockpile. Soil from the sample area consisted of brown to red-brown silty sand with gravel to silty gravel with sand. Trace metal debris and charcoal were present.

Sample SS-5 was collected from the southeast side of the stockpile. Soil from the sample area consisted of brown silty gravel with sand along with trace charcoal, pieces of rope, and other debris.

Samples were packaged in an ice-filled cooler and immediately transported to Friedman & Bruya Laboratory of Seattle, Washington for analysis. Through conversations with personnel from Waste Management, the disposal company selected by GCH, all five samples were analyzed for



a suite of PAHs as well as RCRA 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver) plus copper, nickel, and zinc. Additionally, the samples underwent the toxic characteristic leaching procedure (TCLP) to evaluate for the leaching potential of metals in the soil.

4.1.2 Soil Sample Results

A summary of the soil sample analysis results is presented in Tables 4-1, 4-2, and 4-3 in Appendix IV. A complete copy of the analytical laboratory report and chain-of-custody are also provided in Appendix IV.

Sample analysis results were submitted to Waste Management so they could build a waste profile and allow the material to be transported to an appropriate Waste Management facility. However, based upon their review of the results, PAH concentrations resulted in the soil being designated as a WT02 Washington State Dangerous Waste. Waste Management indicated, however, that the soil could be submitted for fish bioassay testing to further evaluate the toxicity of the soil. If the bioassay came back negative, the soil would no longer be designated as Dangerous Waste.

4.1.3 Fish Bioassay Testing

Stratum Group returned to the Site on May 15, 2023 to collect one additional representative sample from the soil stockpile (SS-6). The sample was placed into a laboratory-supplied 4oz soil jar and immediately shipped via FedEx to the laboratory for fish toxicity testing. Per laboratory recommendations, the sample was shipped at room temperature and without ice packs.

Rainier Environmental of Tacoma, Washington completed the fish toxicity test. Details of the toxicity testing methods, results, and quality assurance procedures are provided in the report from Rainier Environmental, provided in Appendix IV.

According to the Rainier Environmental report, “there was no [fish] mortality during the test. Based on these results, the sample does not designate as either dangerous or extremely hazardous waste.

The results of this testing were submitted to Waste Management and the soil was permitted for disposal at a Waste Management facility.

4.1.4 Soil Disposal

Madsen Enterprise of Clinton, Washington was contracted by SMI to truck the stockpiled soil to the Waste Management disposal facility. Between June 8 and 13, 2023, a total of 26 truck and trailers delivered 801.38 tons of soil to Waste Management’s transfer station in Seattle, Washington.

Copies of the disposal tickets are provided in Appendix IV.



4.2 Waste Disposal (2023-2024)

As GCH took over operations of the Site in early 2023, they identified potentially hazardous substances stored on the Site that were in need of disposal. Waste included nine ~275-gallon totes partially or nearly full of an oily liquid substance, a locked semi-trailer containing hundreds of containers from quart to 55-gallon size, a former paint storage shed east of the west warehouse that contained dozens of quart to 55-gallon size containers of paints, thinners, and solvents, as well as other containers scattered across the various buildings on the Site. Most of these containers were not labeled or unclearly labeled, such that the container's contents could not be determined based on the label.

The former location of these hazardous substance storage areas is shown as Figure 1-3 in Appendix I. GCH engaged Stratum Group to assist with characterization and disposal of some of this hazardous waste material. A formal report documenting these activities has not been prepared. However, a summary of hazardous waste characterization and disposal work completed to date is provided below with supporting documentation presented in Appendix V.

4.2.1 Bilge Water Totes

Stratum Group was engaged to characterize and facilitate disposal of the liquid stored in the totes that had been stored outside the west warehouse. Based upon previous conversations with Lovric's personnel in 2021, the fluid in the totes was oily bilge water that had been pumped out of boats being serviced on the Site.

Stratum Group contacted Marine Vacuum Services (MarVac) of Seattle in April 2023 to determine what analyses were necessary to characterize the waste so MarVac could properly dispose of it. Based upon MarVac's recommendations, two composite samples were collected using a bailer dipped into the totes, combining material from five of the totes for one sample (Tote Comp 1) and four of the totes for the second sample (Tote Comp 2). Both samples were analyzed for RCRA 8 metals, gasoline-, diesel-, and oil-range petroleum hydrocarbons, volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs). The samples were shipped to Friedman & Bruya Laboratory in Seattle, Washington for analysis.

The tote fluid sample results were consistent with the fluid being oily bilge water and MarVac accepted the sampling results to complete the waste profile. MarVac visited the Site on June 1, 2023 and pumped out approximately 2,800 gallons of fluid from the nine totes. MarVac transported the fluid to their Seattle facility for proper disposal.

Copies of the analytical laboratory report with chain-of-custody, the bill of lading, and the invoice from MarVac documenting the fluid removal are provided in Appendix V. A photograph of the tote storage area is provided in Appendix V.



4.2.2 Other Waste Disposal

To characterize and properly dispose of other hazardous waste on the Lovric's Site, GCH engaged WasteXpress of Tacoma, Washington. By December 2023, the semi-trailer previously used for hazardous materials storage was moved from near the base of the main driveway to the southwest corner of the west warehouse for ease of characterization and disposal. No obvious indications of releases from materials stored in the trailer were observed on the ground beneath its former parking spot. By March 15, 2024, WasteXpress had characterized and removed for disposal hundreds of containers of old paint, thinner, solvents, and other paint-related chemicals that had been stored in the paint shed east of the west warehouse in preparation for demolition of that structure. WasteXpress had also collected, characterized, and disposed of dozens of pallets of hazardous waste previously stored inside the west warehouse and inside the semi-trailer. The semi-trailer had been removed from the Site as of March 15, 2024. Disposal tickets indicate that approximately 10,125 pounds of hazardous waste was transported to Chemical Waste Management of the Northwest in Arlington, Oregon, for proper disposal in early December 2023. An additional 2,425 pounds of hazardous waste was removed from the site for proper disposal on March 20, 2024. Copies of these disposal tickets are provided in Appendix V.

Remaining hazardous waste associated with pre-GCH operations was being stored inside the ground floor of the west warehouse awaiting proper disposal. Approximately 3 pallets of 5-gallon buckets and 10 55-gallon drums of characterized hazardous waste were observed remaining inside the warehouse during our March 15, 2024 site visit. Documentation of any future hazardous waste disposal will be provided in future reports.

5.0 CURRENT CONDITIONS

Stratum Group personnel conducted a site visit on March 15, 2024, to observe current Site conditions following the significant amount of interim cleanup work and housekeeping improvements completed by GCH since our initial comprehensive inspection in July 2021. Observations made during this site walk were used to inform recommendations made in this work plan.

Beginning on the west side of the Property, near the base of the primary access driveway, removal of overgrown vegetation, debris, and old equipment has been largely completed. Since 2021, more than a dozen old vehicles, boats, and pieces of heavy equipment have been removed from the Site. A few concrete pontoons, creosote pilings, rubber dock bumpers, a few pieces of equipment, and a scattering of small debris remains west of the bottom of the driveway.

Removal of additional debris, equipment, a dilapidated manufactured home, and overgrown vegetation was completed on the hillside just east and north of the main driveway. Approximately 400 tons of creosote piles, which had been buried within the slope and/or used to support the base of the slope, were removed from the Site for proper disposal (identified as



former buried creosote timber area on Figure 1-3 in Appendix I). Old concrete pontoons have been repurposed as a temporary retaining wall at the base of the slope east of the driveway and the hillside has been hydroseeded.

The recreational marina portion of the Site, west of the industrial activities, remains largely unchanged from 2021, and is used for recreational boat moorage.

GCH personnel confirmed that the area just west of the west warehouse was at one time a barge that had been beached by the prior owners to create additional usable working area for shipyard operations. As the wooden barge decking deteriorated over time, the voids were covered with unsecured steel plates that were surplus from shipyard activities. Debris had been placed in this area and covered by vegetation growth over time. GCH has since removed the debris and vegetation that had built up including a couple of derelict vehicles, removed the steel plates, removed the deteriorated barge decking that had rotted and become unstable, and filled the voids with clean compacted gravel fill so the space could again become a safe working area.

Aside from a few pieces of heavy equipment that are still in use, most of the large debris and derelict vehicles and equipment stored around the outside of the west warehouse have been removed, including an above ground tank and several totes that had been used by the prior owners to store oily bilge water. Oily bilge water that had remained on site as of GCH's acquisition of the Site was characterized and properly disposed of as discussed in Section 4. Two piles of creosote timbers awaiting disposal were stored on the north edge of the west warehouse. One above ground tank remained to the south of the west warehouse, which was reportedly being kept for use as temporary storage of sewage prior to offsite disposal. A thin veneer of clean gravel fill had been placed in the work area east of the west warehouse to facilitate heavy equipment operations.

The interior of the west warehouse is being used for a mix of temporary waste storage and as an active machine shop. A few pallets and drums of characterized hazardous waste remain stored on the west side of the warehouse awaiting collection for disposal. The east side of the warehouse is an active machine shop with tools and spare parts used for boat maintenance and repair. Architects and structural engineers have reportedly inspected beneath the west warehouse building to evaluate the structure integrity of the building foundation and piles and did not report seeing any significant environmental concerns underneath the building during their inspection.

A shed building previously located northeast of the west warehouse had been used to store paints, thinners, and solvents. As of March 2024, the shed has been demolished and removed from the Site. Prior to demolition, all remaining products and waste material was properly disposed of and/or was characterized and stored inside the west warehouse awaiting disposal by WasteXpress (see Section 4.2.2 and Appendix V).

Mobile office buildings, previously located south of the west warehouse, have been removed. A new mobile office container has been placed in the same location as the former mobile office and



was being plumbed to an above ground holding tank for sewage pump out.

An old boat that had previously been undergoing repairs between the two marine railways and a canopy that had been partially covering the boat have been removed. In total, approximately 5 or 6 large vessels have been removed from the Site since GCH's acquisition. A partially sunken barge located between the railways that was previously used as a wood shop has been mostly cleared of its contents (woodworking supplies and equipment) in preparation for its eventual removal.

According to GCH, both marine railways have undergone needed repairs and are actively being used. The tanks and totes previously stored along the east railways have been removed. Stacks of tools and a covered paint storage and mixing stall remain over concrete on the side of the east railways. The metal fabrication area east of the east railways remains largely unchanged. A large ship was actively being painted and/or repaired at the time of our site visit and the tide gates were being used to keep ocean water out and contain Site process water.

An old wooden shed, previously located just east of the metal fabrication area, has been removed. According to GCH, no evidence of USTs or environmental contamination was observed underneath the building when it was removed. This is consistent with the lack of evidence of USTs identified during a ground penetrating radar survey in the vicinity of the building in 2022 (Stratum Group, 2022).

Above ground fuel tanks that were previously located north of the wooden shed have been moved. Fueling for the Site currently takes place near the southwest corner of the east warehouse. Fuel is stored in one ~750-gallon gasoline AST that is stored inside a containment tray and one ~750-gallon diesel AST. Two tanks that look to be out of service, including a ~250-gallon AST and one ~2,000-gallon AST, were being stored on a steel slab around the corner from the active tanks to the northwest. A small area of stained gravel was observed between the two active tanks, but no obvious indications of significant leaks or petroleum releases were observed in the vicinity of the active fueling area.

Vegetation and debris that previously covered the steep slope between the shoreline working area and the mid-slope access road has been cleared and removed.

A large soil and debris pile previously located west of the east warehouse has been removed from the Site for proper disposal (see Section 4 and Appendix IV for further details). According to GCH, fill material was excavated from beneath the former stockpile location until it appeared that all major debris had been removed. Scattered micro-debris was noted in the remaining fill soils; however, no obvious indications of contamination or large debris was noted. Most of the other debris and derelict equipment stored west of the east warehouse has been removed, leaving only some creosote timbers, scrap metal, and a thin veneer of freshly placed clean gravel fill. The east warehouse building remains a machine shop. Most of the derelict equipment, boat motors, drums of hazardous substances, and junk previously located underneath the east building



breezeway area and outside the east warehouse to the east has been removed. The breezeway that connected the east warehouse to the “tin building” to the east has been demolished after being found to be structurally unsound.

One large AST was being stored by the northeast corner of the east warehouse. The tank is reportedly being used to store sewage until it can be disposed of offsite.

A large dumpster-like receptacle previously used as a secondary containment structure for a waste oil tank storage by Lovric's remains between the east warehouse and the “tin building” and a storage tank remains inside the dumpster. Some fluid was observed pooled in the base of the dumpster. GCH has indicated that the used oil tank inside the dumpster has been pumped clean and the tank is no longer in active use. This could not be confirmed at the time of our site visit. No obvious leaks or significant contamination of surface soils around the dumpster was observed during our site visit.

The interior of the “tin building” has been largely cleared of boat motors, derelict equipment, drums of hazardous substances, and junk previously stored inside. The entire building has a concrete slab floor with no apparent floor drains. GCH cleaned the floors prior to their use of the building, revealing the concrete underneath. The concrete did not appear to be a new feature of the building. A shed that had previously been attached to the north side of the tin building, where several bags of sandblast grit had been stored, has been removed along with stored sandblast grit.

Currently, the tin building is being used to store materials and equipment actively being used for shipyard operations. Most of the equipment is stored in shelving along the edges of the building and the floor is largely clear. Several 55-gallon drums used to store new motor oil, hydraulic oil, used oil, oil filters, used oil- and thinner-soaked pads and rags, and used sorbent sock booms, and scrap metal are being stored inside the building. No obvious leaks or releases were observed.

Much of the equipment and junk that had been piled around the outside of the tin building and the east warehouse have been removed. Notably, a large metal press, which in 2021 had reportedly been being used to crush old oil filters, has been removed from the south exterior wall of the east warehouse. A minor petroleum odor was detected in the immediate vicinity of where that equipment had been located, which is consistent with leaks of oil from the press that were observed back in 2021. A thin veneer of new clean gravel fill has been placed across the working driveway areas surrounding these buildings.

GCH is currently utilizing the parcel immediately to the east of the Property for additional storage and parking. Several totes of used motor located in this area in December 2023 have been removed for disposal by a third-party contractor. We observed no evidence of leaks or releases around the former tote storage area.

An annotated aerial photograph with key Site features, as of March 2024, is provided in Figure 1-3 in Appendix I. Photos showing an overview of current Site conditions as of March 2024 are



provided in Appendix I.

6.0 CONCEPTUAL SITE MODEL

A schematic representation of the Conceptual Site Model is presented in Figure 1-4 in Appendix I. The schematic representation identifies the potential contamination sources in the upland portion of the Site, transport mechanisms, exposure pathways, and potential receptors.

It is our understanding that GCH and SMI plan to continue operating the Site as an industrial shipyard and recreational marina for the foreseeable future and are investing heavily in property improvements towards promoting those uses. Therefore, future changes in property use that would significantly alter the potential receptors to contaminants on the site (e.g., land-based residential) are not anticipated and are therefore not considered in the conceptual site model.

6.1 Potential Contamination Sources

Current and historical shipyard activities on the Site are spread across approximately 5 acres of shoreline and nearshore areas. The Site has operated as an active shipyard since at least the mid-1960s and historical research indicates that the locations of structures and business activities on the Site have remained largely unchanged since at least the late 1960s.

Shipyard activities either currently or likely previously included fueling of shipyard equipment, boat hull and motor maintenance and repair, painting and paint stripping, sandblasting, boat hull anode installation and disposal, metal fabrication, woodworking, and heavy equipment operation. We have also observed creosote timbers in active use in Site bulkheads, stored across the Site surface, and previously buried on the Site in three known locations (fill pile adjacent to the east warehouse, fill slopes southwest of the west warehouse, and storage area west of the base of the main driveway).

Several known or suspected point sources of potential releases exist on the Site.

- Two 10,000-gallon USTs, previously located north of the tin building in the northeast corner of the Site. The tanks are believed to have stored fuel oil and Bunker C and may have been used for small vessel or site equipment fueling.
- Waste oil is known to have been stored in above ground tanks located north of the breezeway/workspace between the east warehouse and the tin building.
- Boat sandblasting and metal fabrication activities have been concentrated around the two marine railways and, at present, the metal fabrication shed area just east of the east railways.



- Paints, thinners, and solvents were previously stored in a shed located across the driveway from the northeast corner of the west warehouse.

In addition to these suspected point sources, known and suspected operations suggest the potential for releases from a history of heavy equipment operation and long-term exterior storage of scrap metal, creosote timbers, and other debris. Such heavy equipment operation can be associated with periodic leaks and spills of fuel and/or lubricants over time. Additionally, long-term exterior storage of scrap metal and creosote timbers, as has occurred in multiple locations across the Site, can cause the material to weather in place, potentially impacting underlying soils.

6.2 Contaminants of Concern

Based upon the known or suspected potential contamination sources, suspected contaminants of concern (COCs) at the upland portions of the Site include:

- Oil-range petroleum
- Diesel-range petroleum
- Gasoline-range petroleum
- Volatile organic compounds (VOCs)
- Semivolatile organic compounds (SVOCs)
 - Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) and naphthalene
- Metals (arsenic, cadmium, chromium, lead, mercury, copper, zinc)
- Polychlorinated biphenyls (PCBs)
- Tributyltin (TBT)

Initial sampling work conducted by Stratum Group in 2022 confirmed the presence of contamination in at least three locations on upland areas of the Site. Contaminants of concern identified above Model Toxics Control Act (MTCA) Method A cleanup levels (CULs) in 2022 include diesel- and oil-range petroleum hydrocarbons, metals (mercury, arsenic, and/or lead), and cPAHs.

6.3 Potential Exposure Pathways

All potential exposure pathways, based upon our current understanding of the Site, are provided in Figure 1-4, in Appendix I. The remedial investigation proposed below will assist in determining which exposure and/or migration pathways are complete and which are incomplete and therefore do not pose a significant risk to human health or the environment.

The primary exposure pathways for known and suspected releases on the Site include direct contact with and/or ingestion of contaminated soil, groundwater, surface water, and sediments, contaminant migration from soil to groundwater, migration from soil and/or groundwater to surface water/sediments, migration from surface water to sediments, and potential vapor intrusion risk. Guemes Channel is the only surface water body considered for potential surface



water impacts.

At present, potential human receptors include commercial/industrial workers, construction workers, tribal fishers and seafood consumers, and users/occupants of the recreational marina. Potential ecological receptors include terrestrial and aquatic wildlife.

No drinking water wells are known to be present on the Property or within at least one mile of the subject property and water is delivered to the Property from a public utility. Therefore, ingestion of site groundwater is unlikely. However, until Site groundwater can be established as a non-potable resource per WAC 173-340-720, the groundwater ingestion pathway is considered potentially complete.

Known and suspected contamination on the Site includes those with volatile components (e.g., petroleum, VOCs, SVOCs), that can migrate into structures and potentially pose a vapor intrusion risk. Thus, vapor intrusion (VI) must be considered as a potential exposure pathway for the Site. Which COCs are present in which locations at sufficient concentrations to pose a potential vapor intrusion risk is not known at this time. Structures that are used daily include both warehouses and the tin buildings, which leave their doors open when in use, combined with the general draftiness of the old structures, allows significant airflow through the buildings. Such air circulation likely limits the acute industrial worker exposure to hazardous vapors if they are present. Additionally, many, if not all, of the existing enclosed structures on the Site are slated for demolition. Therefore, direct assessment of the potential vapor intrusion risk to existing or proposed future structures on the property should be delayed until a better understanding of the potential VI COCs is obtained from preliminary investigation proposed below and a more complete understanding of future facility modernization plans is crafted by GCH.

The findings of this remedial investigation will be used to update and refine the conceptual site model for the Site.

6.4 Site Cleanup Levels

Although some sampling work has been completed on the Site to date, it is our opinion that insufficient information exists to establish all of the known contaminants of concern on the Site. An evaluation of appropriate cleanup levels (CULs) will be completed as part of the preliminary RI report, as discussed below (Section 8.9).

For the purposes of this RI, preliminary screening levels have been developed to allow initial evaluation of the extent and magnitude of Site contamination and determination of Site COCs (see Section 8.6).

Final site-specific CULs for the Site will need to take into account current and future land use (e.g., unrestricted land use or industrial land use) and be protective of all media (soil, surface water, marine water, groundwater, and air via vapor intrusion). Additionally, a terrestrial ecological evaluation (TEE) will need to be completed to determine whether cleanup standards



need to be protective of terrestrial ecology (e.g., wildlife, soil biota, plants).

7.0 IDENTIFIED UPLAND DATA GAPS

Several data gaps remain to characterize the nature and extent of contamination at the Site. The data gaps identified on the upland portion of the Site include:

- Insufficient characterization of petroleum contamination of soil and groundwater around the former fuel oil USTs. Previous sampling did not sufficiently analyze samples for oil-range petroleum and no groundwater samples were collected.
- Insufficient characterization of potential contamination within nearshore fill zones.
- Insufficient characterization of shallow soil impacts in association with petroleum spills and metal weathering across high traffic areas and storage areas on the upland areas of the Site.
- No evaluation of potential releases from the former used oil storage tank between the east warehouse and the tin building.
- No evaluation of potential releases of paints and solvents around the former paint shed.
- No evaluation of potential boat maintenance-related contamination around the marine railways, including underneath the concrete pads that underlie the railways and the metal fabrication shed.
- No evaluation of potential releases (primarily petroleum) by former oily bilge water storage areas between the west warehouse and west railways.
- No evaluation of potential contamination of fill soils where buried creosote piles have been identified and removed.
- No evaluation of soils beneath the floors of the west warehouse, particularly immediately below a utility sink near the northeast corner of the building that discharged to the bare ground.
 - The results of previous investigations (see Section 3.4) showing that widespread impacts from this historical discharge are not likely. However, this data gap may be addressed more thoroughly during future investigations once the building has been removed, eliminating safety concerns associated with sampling underneath the building.
- No evaluation of the site uplands (besides stormwater runoff from marine railways) as a source of SVOC contamination to marine sediments in submerged portions of the site.
 - It is understood that future site investigations will require the installation and sampling of permanent groundwater monitoring wells. Due to concerns of artificially high biased SVOC results in reconnaissance water samples, this data gap will be addressed during future well installation and sampling, which will be proposed in a work plan addendum to be prepared following this initial round of investigation.



8.0 PROPOSED UPLAND WORK PLAN

The work plan proposed herein was designed to address the identified data gaps and further characterize the nature and extent of contamination on the upland portions of the Site. We propose a combination of soil and reconnaissance groundwater sampling to evaluate the nature and extent of contamination at the Site, to help determine where long-term monitoring (e.g., groundwater monitoring wells) is needed on the Site, to determine appropriate CULs for the Site, and to provide a baseline for evaluating potential cleanup options.

Based upon the size of the Site, its history of industrial activities, and the limited amount of previous environmental assessment, we anticipate that additional Site characterization will be required beyond the work outlined below. However, the work outlined below will create a baseline understanding of Site conditions and determine the key areas of concern so that future evaluation is more narrowly targeted. Additionally, if specific COCs are not found and/or areas are deemed to meet site-specific CULs, then those COCs can be removed from future analysis. Stratum Group personnel will coordinate and be onsite to oversee subcontractors and collect soil and groundwater samples. Subcontractors will be utilized, as needed, during the project including well drilling professionals, Ecology accredited laboratories for sample analysis, and ground penetrating radar and private utility locate professionals.

All fieldwork and sampling activities will be completed in accordance with the project HASP and SAP/QAPP, copies of which are provided in Appendix VI.

8.1 Preparatory Activities

Prior to implementation of this work plan, written approval will be obtained from Ecology and GCH.

At least two business days prior to the scheduled commencement of ground disturbing activities, proposed subsurface sampling locations will be marked with white paint and the One-Call Utility Notification Service will be notified.

A professional private utility locating service will be engaged to do a conductible locate and a ground penetrating radar (GPR) to further identify any underground utilities and/or buried objects in the vicinity of the proposed sampling locations. GPR is a non-destructive technique that uses radar to create images of the subsurface. Buried objects and other anomalies are identified based on the imagery developed during the investigation. This type of investigation will not determine if contamination is present but will assist in determining if utility lines or tanks are present or may have previously been located. This information can direct where soil and groundwater samples should/should not be collected. GPR will also further clear our proposed sampling locations to provide extra certainty that no obvious obstructions are present. The utilities identified through the private locate company will be marked with paint on the ground surface and flagged for future information purposes.



Based upon previous investigations and known historical information about the Site, no underground storage tanks are suspected to be present on the Site at this time.

8.2 Cultural Resources Assessment

The Site is undergoing remedial investigation under an Agreed Order with the State of Washington. Per WAC 173-340-815(3)(b), prior to ground disturbing activities on the Site, the Washington Department of Archaeology and Historic Preservation (DAHP) and affected Indian tribes must be consulted on the potential effects of the planned activities.

If the initial consultation with DAHP and the tribes results in a required cultural resources survey for the Site, ground disturbing activities will not commence until the survey has been completed or permission for the proposed ground disturbing activities has been granted in writing by DAHP. Any supplemental requirements outlined in the final approval from DAHP, such as archeological monitoring during sampling activities, will be followed.

If items of potential cultural resource value are observed during ground disturbing activities, field personnel will follow the conditions of the Inadvertent Discovery Plan (IDP), a copy of which is provided in Appendix VI.

8.3 Subsurface Soil and Reconnaissance Groundwater Sampling

We propose completion of 18 borings in the upland areas of the Site. Drilling and sampling activities will be conducted in accordance with the SAP/QAPP, provided in Appendix VI.

A continuous 2-inch diameter core of the subsurface soils will be collected for visual analysis and sampling. Soil cores will be field examined by Stratum Group personnel for obvious indications of contamination including discoloration, odors, and petroleum sheens. Field personnel will utilize a photoionization detector (PID) to scan for volatile vapors associated with contaminants of concern.

Borings will be advanced to depths of approximately 15 feet bgs. We anticipate that these borings will be completed at least 3 feet into native soil deposits and well into the shallow groundwater zone. If areas of fill greater than 15 feet thick are observed, the boring will be advanced further at least 3 feet into native material or the drill rig encounters refusal. If contamination is suspected at the base of the boring through field testing, then the boring will be extended until clean soils are encountered, or the drill rig encounters refusal.

Stratum Group will be onsite to collect soil samples during drilling of the environmental borings. A minimum of three soil samples will be collected from each boring location, except as described below:

- One sample from fill material between 0 to 5 feet bgs (~3 feet bgs)
- One sample from fill material between 5 and 10 feet bgs (~7 feet bgs)



- One sample from underlying native soil/fill (~10 feet bgs)

If fill material greater than 10 feet thick is encountered, one additional soil sample will be collected from fill between 10 and 15 feet bgs. Samples will be collected where historical research and field evidence suggest contamination is most likely to be present. Obvious field indications of contamination may be used to adjust sampling depths and/or inform additional sampling depths during field activities.

For location SB9, one shallow soil sample will be collected from the upper 1 foot of the soil column beneath the concrete slab, one sample will be collected from deeper fill material, and one sample will be collected from underlying native soil.

Fill material beneath the marine railways is anticipated to be very thin compared to the rest of the Site. Therefore, for borings completed through the marine railways (SB10 and SB12), one shallow soil sample will be collected from the upper 1 foot of the soil column beneath the concrete slab and one sample will be collected from underlying native soil. If thicker than anticipated fill material is encountered, one additional soil sample will be collected from within the zone of fill material.

After completion of each boring, a temporary well will be placed in the borehole for collection of reconnaissance groundwater samples. The well screen will be placed to capture the top of the groundwater table encountered in that boring. Temporary wells will be purged using low flow pumping techniques prior to sampling until turbidity has been greatly reduced. Once purge water turbidity appears to have stabilized, Stratum Group personnel will collect one reconnaissance groundwater sample from each of the temporary wells.

After soil and reconnaissance groundwater samples have been collected, the temporary wells will be removed, and the borings will be decommissioned in accordance with the SAP/QAPP.

Our proposed boring locations are provided in Figures 1-5 and 1-6 in Appendix I. Soil boring locations are identified by SB1 through SB15 in the figures. Rationale for each of the boring locations is provided in Table 2, below.



Table 2. Boring Location Rationale

Boring ID	Location	Rationale
Boring locations presented in Figure 1-5 (east side of Lovric's)		
SB1	N of former UST area	Evaluate northern, eastern, and western extent of petroleum contamination from former fuel oil USTs
SB2	E of former UST area	
SB3	W of former UST area	
SB4	Alcove between E Warehouse and tin building	Evaluate suspected petroleum contamination related to surface spills from former waste oil storage. Evaluate southern extent of petroleum contamination from former fuel oil USTs.
SB5	SE corner of E Warehouse	Evaluate suspected petroleum contamination beneath former metal press/oil filter crusher
SB6	NW corner of E Warehouse	Evaluate fill thickness and potential contamination within fill material
SB7	Storage area W of E Warehouse	Evaluate residual soil conditions beneath the former fill soil stockpile
SB8	Adjacent to active equipment fueling area and former scrap storage	Evaluate extent of contamination identified in 2022 investigation (SG-2)
SB9		
SB10	N of metal fabrication shed	Evaluate potential contamination associated with long term metal fabrication and boat repair activities
SB11	Through E railways	Evaluate potential contamination associated with long term boat repair activities
SB12	Work area between the railways	Evaluate potential contamination associated with long term boat repair activities and junk storage
Boring location presented in Figure 1-6 (west side of Lovric's)		
SB13	Through W railways	Evaluate potential contamination associated with long term boat repair activities
SB14	Former bilge water storage area on east side of W Warehouse	Evaluate potential contamination associated with oily water storage
SB15	Through former paint shed	Evaluate potential contamination associated with former paint, thinner, and solvent storage.
SB16	N edge of slope in former creosote timber fill area	Evaluate residual soil for contamination associated with fill and former buried creosote timbers
SB17	W side of the bottom of the main driveway	Evaluate potential contamination in former location of hazardous waste semi-trailer
SB18	S edge of W gravel driveway extension	Evaluate potential contamination associated with long term equipment and junk storage

8.4 Surface Soil Sampling

During the same mobilization as the soil borings described above, shallow soil samples will be



collected in several locations around the Site. Many of the potential sources of contamination on the Site stem from the history of industrial activities on the surface. Therefore, we suspect that much of the contamination on the Site will be limited to the upper 6 to 12 inches of Site soils.

Prior to completion of each boring, one soil sample will be collected from the upper ~6 inches using hand tools. Surface samples will not be collected where the surface is currently covered by an impermeable surface (e.g., concrete). This includes borings SB10, SB11, and SB13.

Additionally, surface samples will be collected in known high traffic areas or areas where significant debris and equipment storage is known to have taken place.

The surface sample locations, not affiliated with the boring locations, have been labeled SS1 through SS8 and are shown on Figures 1-5 and 1-6 in Appendix I.

8.5 Sample Analysis Plan

Environmental samples collected as part of this work plan will be delivered or mailed to a laboratory with Department of Ecology accreditation for the required analysis.

In locations where petroleum contamination is suspected purely due to general industrial activities on the Site and not due to a specific point source, we propose an initial petroleum screen using the hydrocarbon identification (HCID) analysis. If one or multiple hydrocarbon ranges are elevated based on the HCID analysis, then the sample will be further analyzed for specific hydrocarbon fractions (e.g., NWTPH-DX for diesel and oil, and/or NWTPH-GX and targeted VOCs for gasoline).

Significant volumes of organic material have not been encountered in Site fill material during investigations completed to date. However, if areas of high organic content are encountered, and soil samples are found to contain elevated concentrations of diesel- and/or oil-range petroleum, samples may be reanalyzed for NWTPH-DX after being subjected to the silica gel cleanup (SGC) protocol. If deemed necessary based on field observations, application of SGC will be utilized to remove interference from non-petroleum polar organic material that may artificially bias sample results high. SGC will not be applied to reconnaissance groundwater samples collected for this investigation, as only water samples collected from permanent monitoring wells may be eligible to utilize SGC, per Ecology's guidance (Ecology, 2023).

Reconnaissance groundwater samples that will be analyzed for metals will be initially analyzed for total metals. If elevated metals concentrations are detected from these analyses, the samples will be laboratory filtered and re-analyzed for dissolved metals.

The proposed analytical schedule is provided in Table 3, below, including the methodology recommended for the analysis.



Table 3. Sample Analysis Plan

Boring	Sample Description	Contaminants of Concern	Analytical Method
SB1 through SB3	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample per boring	Diesel & Oil	NWTPH-Dx
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
SB4	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	Diesel & Oil	NWTPH-Dx
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
		VOCs	EPA 8260D
		PCBs	EPA 8082A
SB5	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	Diesel & Oil	NWTPH-Dx
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
SB6 & SB7	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample per boring	HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
SB8 & SB9	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	Diesel & Oil	NWTPH-Dx
		Gasoline	NWTPH-Gx
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
SB10	3 subsurface soil samples & 1 reconnaissance groundwater sample	HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		Tributyltin	EPA 8270E-SIM
SB11 & SB13	2 subsurface soil samples & 1 reconnaissance groundwater sample per boring	HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		Tributyltin	EPA 8270E-SIM
SB12	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
		VOCs	EPA 8260D
		PCBs	EPA 8082A
		Tributyltin	EPA 8270E-SIM



Table 3. Sample Analysis Plan (continued)

Boring	Sample Description	Contaminants of Concern	Analytical Method
SB14	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
SB15	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
		VOCs	EPA 8260D
		Tributyltin	EPA 8270E-SIM
SB16	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
		PCBs	EPA 8082A
SB17	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
		VOCs	EPA 8260D
SB18	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
SS1 through SS8	1 surface soil sample per boring	HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E

8.6 Contaminant Screening Levels

The current understanding of Site contamination is insufficient to develop site-specific CULs. Table 4 and 5, below, present the range of potential CULs for soil and groundwater for the suspected COCs based on the potential exposure pathways discussed in Section 6.3. The most restrictive CUL for each analyte is presented in the rightmost column(s) of each table. These values will be used as initial screening levels for this investigation until Site contamination is more well understood and the conceptual site model can be refined. For groundwater samples, the most restrictive screening levels for potable water will be used as the screening level unless



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and until Site groundwater is shown to be qualify as a non-potable water resource. In accordance with MTCA, preliminary screening levels are not set at concentrations less than the practical quantitation limit (PQL) or natural background.



Table 4. Preliminary Contaminant Screening Levels - Soil

Analyte		Contaminant Concentrations (mg/kg)										
		Soil Protective of Human Direct Contact				Soil Protective of Leachability to Groundwater		Soil Protective of Terrestrial Wildlife _c (<i>tee</i>)	Natural Background Concentration _d (<i>back</i>)	Practical Quantitation Level _e (<i>pql</i>)	Most Stringent Screening Level	
		MTCA Method A (<i>mA</i>)	MTCA Method A Industrial (<i>mAII</i>)	MTCA Method B Direct Contact (most restrictive) (<i>mB</i>)	MTCA Method C Direct Contact (most restrictive) (<i>mC</i>)	Protective of Groundwater (unsaturated) (<i>gwl-u</i>)	Protective of Groundwater (saturated) (<i>gwl-s</i>)				Unsaturated Soil	Saturated Soil
Total Petroleum Hydrocarbons	Diesel	2,000 _a	2,000 _a	-	-	-	-	6,000 _a	-	50	2,000 _a (<i>mA</i>)	
	Oil			-	-	-	-		250			
	Gasoline	30/100 _b	30/100 _b	-	-	-	-	5,000 _b	-	2	30/100 _b (<i>mA</i>)	
VOCs	Benzene	0.03	0.03	18 (c)	2,400 (c)	0.027	0.0017	-	-	0.03	0.03 (<i>mA</i>)	
	Toluene	7	7	6,400	280,000	4.5	0.27	-	-	0.05	4.5 (<i>gwl-u</i>)	0.27 (<i>gwl-s</i>)
	Ethylbenzene	6	6	8,000	350,000	5.9	0.34	-	-	0.05	5.9 (<i>gwl-u</i>)	0.34 (<i>gwl-s</i>)
	Xylenes (m,p,o)	9	9	16,000	700,000	14	0.83	-	-	0.15	14 (<i>gwl-u</i>)	0.83 (<i>gwl-s</i>)
	Dichlorodifluoromethane	-	-	16,000	700,000	38	0.53	-	-	0.5	38 (<i>gwl-u</i>)	0.53 (<i>gwl-s</i>)
	Chloromethane	-	-	-	-	-	-	-	-	0.5	-	-
	Vinyl chloride	-	-	0.67 (c)	88 (c)	0.0017	0.00009	-	-	0.05	0.05 (<i>pql</i>)	0.05 (<i>pql</i>)
	Bromomethane	-	-	110	4,900	0.051	0.0033	-	-	0.5	0.5 (<i>pql</i>)	0.5 (<i>pql</i>)
	Chloroethane	-	-	-	-	-	-	-	-	0.5	-	-
	Trichlorofluoromethane	-	-	24,000	1,100,000	23	0.79	-	-	0.5	23 (<i>gwl-u</i>)	0.79 (<i>gwl-s</i>)
	Acetone	-	-	72,000	3,200,000	29	2.1	-	-	5	29 (<i>gwl-u</i>)	5 (<i>gwl-s</i>)
	1,1-Dichloroethene	-	-	4,000	180,000	0.046	0.0025	-	-	0.05	0.05 (<i>pql</i>)	0.05 (<i>pql</i>)
	Hexane	-	-	4,800	210,000	72	1.8	-	-	0.25	72 (<i>gwl-u</i>)	1.8 (<i>gwl-s</i>)
	Methylene chloride	0.02	0.02	94 (c)	21,000	0.022	0.0015	-	-	0.5	0.5 (<i>pql</i>)	0.5 (<i>pql</i>)
	Methyl t-butyl ether (MTBE)	0.1	0.1	560 (c)	73,000 (c)	0.1	0.0072	-	-	0.05	0.1 (<i>gwl-u</i>)	0.05 (<i>pql</i>)
	trans-1,2-Dichloroethene	-	-	1,600	70,000	52	0.032	-	-	0.05	52 (<i>gwl-u</i>)	0.05 (<i>pql</i>)
	1,1-Dichloroethane	-	-	180 (c)	23,000	0.041	0.0026	-	-	0.05	0.05 (<i>pql</i>)	0.05 (<i>pql</i>)
	2,2-Dichloropropane	-	-	-	-	-	-	-	-	0.05	-	-
	cis-1,2-Dichloroethene	-	-	160	7,000	0.079	0.0052	-	-	0.05	0.079 (<i>gwl-u</i>)	0.05 (<i>pql</i>)
	Chloroform	-	-	32 (c)	4,200 (c)	0.074	0.0048	-	-	0.05	0.074 (<i>gwl-u</i>)	0.05 (<i>pql</i>)
	2-Butanone (MEK)	-	-	48,000	2,100,000	20	1.4	-	-	1	20 (<i>gwl-u</i>)	1.4 (<i>gwl-s</i>)
	1,2-Dichloroethane (EDC)	-	-	11 (c)	1,400 (c)	0.023	0.0016	-	-	0.05	0.05 (<i>pql</i>)	0.05 (<i>pql</i>)
	1,1,1-Trichloroethane	2	2	160,000	7,000,000	1.5	0.084	-	-	0.05	1.5 (<i>gwl-u</i>)	0.084 (<i>gwl-s</i>)
	1,1-Dichloropropene	-	-	-	-	-	-	-	-	0.05	-	-
	Carbon tetrachloride	-	-	14 (c)	1,900 (c)	0.041	0.0022	-	-	0.05	0.05 (<i>pql</i>)	0.05 (<i>pql</i>)
	Trichloroethene	0.03	0.03	12 (c)	1,800	0.025	0.0015	-	-	0.02	0.05 (<i>pql</i>)	0.05 (<i>pql</i>)
	1,2-Dichloropropane	-	-	27 (c)	3,500 (c)	0.025	0.0017	-	-	0.05	0.05 (<i>pql</i>)	0.05 (<i>pql</i>)
	Bromodichloromethane	-	-	16 (c)	2,100 (c)	0.033	0.0022	-	-	0.05	0.05 (<i>pql</i>)	0.05 (<i>pql</i>)
	Dibromomethane	-	-	800	35,000	0.36	0.025	-	-	0.05	0.36 (<i>gwl-u</i>)	0.05 (<i>pql</i>)
	4-Methyl-2-pentanone	-	-	6,400	280,000	2.7	0.19	-	-	1	2.7 (<i>gwl-u</i>)	1 (<i>pql</i>)
	cis-1,3-Dichloropropene	-	-	-	-	-	-	-	-	0.05	-	-
	trans-1,3-Dichloropropene	-	-	-	-	-	-	-	-	0.05	-	-
	1,1,2-Trichloroethane	-	-	18 (c)	2,300 (c)	0.017	0.0011	-	-	0.05	0.05 (<i>pql</i>)	0.05 (<i>pql</i>)
	2-Hexanone	-	-	400	18,000	0.17	0.012	-	-	0.5	0.5 (<i>pql</i>)	0.5 (<i>pql</i>)
	1,3-Dichloropropane	-	-	1,600	70,000	0.88	0.057	-	-	0.05	0.88 (<i>gwl-u</i>)	0.057 (<i>gwl-s</i>)



Table 4. Preliminary Contaminant Screening Levels – Soil (continued)

Analyte		Contaminant Concentrations (mg/kg)										
		Soil Protective of Human Direct Contact				Soil Protective of Leachability to Groundwater		Soil Protective of Terrestrial Wildlife _c (tee)	Natural Background Concentration _d (back)	Practical Quantitation Level _e (pql)	Most Stringent Screening Level	
		MTCA Method A (mA)	MTCA Method A Industrial (mAI)	MTCA Method B Direct Contact (most restrictive) (mB)	MTCA Method C Direct Contact (most restrictive) (mC)	Protective of Groundwater (unsaturated) (gwl-u)	Protective of Groundwater (saturated) (gwl-s)				Unsaturated Soil	Saturated Soil
VOCs	Tetrachloroethene	0.05	0.05	480	21,000	0.05	0.0028	-	-	0.025	0.05 (gwl-u)	0.025 (pql)
	Dibromochloromethane	-	-	12 (c)	1,600 (c)	0.024	0.0017	-	-	0.05	0.05 (pql)	0.05 (pql)
	1,2-Dibromoethane (EDB)	0.005	0.005	0.5 (c)	66 (c)	0.00027	0.000018	-	-	0.005	0.005 (mA)	
	Chlorobenzene	-	-	1,600	70,000	0.86	0.051	-	-	0.05	0.86 (gwl-u)	0.051 (gwl-s)
	1,1,1,2-Tetrachloroethane	-	-	38 (c)	5,000 (c)	0.0098	0.00063	-	-	0.05	0.05 (pql)	0.05 (pql)
	Styrene	-	-	16,000	700,000	2.2	0.12	-	-	0.05	2.2 (gwl-u)	0.12 (gwl-s)
	Isopropylbenzene	-	-	8,000	350,000	15	0.79	-	-	0.05	15 (gwl-u)	0.79 (gwl-s)
	Bromoform	-	-	130 (c)	17,000 (c)	0.36	0.023	-	-	0.05	0.36 (gwl-u)	0.05 (pql)
	n-Propylbenzene	-	-	8,000	350,000	16	0.88	-	-	0.05	16 (gwl-u)	0.88 (gwl-s)
	Bromobenzene	-	-	640	28,000	0.56	0.033	-	-	0.05	0.56 (gwl-u)	0.05 (pql)
	1,3,5-Trimethylbenzene	-	-	800	35,000	1.3	0.071	-	-	0.05	1.3 (gwl-u)	0.071 (gwl-s)
	1,1,2,2-Tetrachloroethane	-	-	5 (c)	660 (c)	0.0012	0.00008	-	-	0.05	0.05 (pql)	0.05 (pql)
	2-Chlorotoluene	-	-	1,600	70,000	1.9	0.11	-	-	0.05	1.9 (gwl-u)	0.11 (gwl-s)
	4-Chlorotoluene	-	-	1,600	70,000	1.9	0.11	-	-	0.05	1.9 (gwl-u)	0.11 (gwl-s)
	tert-Butylbenzene	-	-	8,000	350,000	20	1	-	-	0.05	20 (gwl-u)	1 (gwl-s)
	1,2,4-Trimethylbenzene	-	-	800	35,000	1.3	0.072	-	-	0.05	1.3 (gwl-u)	0.072 (gwl-s)
	sec-Butylbenzene	-	-	8,000	350,000	25	1.3	-	-	0.05	25 (gwl-u)	1.3 (gwl-s)
	p-Isopropyltoluene	-	-	-	-	-	-	-	-	0.05	-	-
	1,3-Dichlorobenzene	-	-	-	-	0.023	0.0013	-	-	0.05	0.05 (pql)	0.05 (pql)
	1,4-Dichlorobenzene	-	-	190 (c)	24,000 (c)	1.2	0.068	-	-	0.05	1.2 (gwl-u)	0.068 (gwl-s)
	1,2-Dichlorobenzene	-	-	7,200	320,000	7	0.4	-	-	0.05	7 (gwl-u)	0.4 (gwl-s)
	1,2,4-Trichlorobenzene	-	-	34 (c)	4,500 (c)	0.56	0.029	-	-	0.25	0.56 (gwl-u)	0.25 (pql)
	Hexachlorobutadiene	-	-	13 (c)	1,700 (c)	0.012	0.00063	-	-	0.25	0.25 (pql)	0.25 (pql)
	1,2,3-Trichlorobenzene	-	-	64	2,800	0.2	0.011	-	-	0.25	0.25 (pql)	0.25 (pql)
Metals	Arsenic	20	20	0.67 (c)	88 (c)	2.9	0.15	132	7	1	7 (back)	
	Cadmium	2	2	80	3,500	0.69	0.035	14	1	1	1 (pql)	1 (pql)
	Chromium (III)	2,000	2,000	120,000	5,300,000	480,000	24,000	67	48	1	67 (tee)	
	Lead	250	1,000	-	-	3,000	150	118	24	1	118 (tee)	
	Mercury	2	2	-	-	2.1	0.1	5.5	0.07	0.025	2.1 (gwl-u)	0.1 (gwl-s)
	Copper	-	-	3,200	140,000	280	14	217	36	5	217 (tee)	36 (back)
	Zinc	-	-	24,000	1,100,000	6,000	300	360	85	5	360 (tee)	300 (gwl-s)
PCBs	Aroclor 1016	-	-	5.6	250	1.2	0.06		-	0.02	1.2 (gwl-u)	0.06 (gwl-s)
	Aroclor 1254	-	-	0.5 (c)	66 (c)	0.057	0.0029		-	0.02	0.057 (gwl-u)	0.02 (pql)
	Aroclor 1260	-	-	0.5 (c)	66 (c)	0.36	0.018		-	0.02	0.36 (gwl-u)	0.02 (pql)
	Total PCBs	1	10	0.5 (c)	66 (c)	0.34	0.017	0.65	-	0.02	0.34 (gwl-u)	0.02 (pql)



Table 4. Preliminary Contaminant Screening Levels – Soil (continued)

Analyte		Contaminant Concentrations (mg/kg)										
		Soil Protective of Human Direct Contact				Soil Protective of Leachability to Groundwater		Soil Protective of Terrestrial Wildlife _c (<i>tee</i>)	Natural Background Concentration _d (<i>back</i>)	Practical Quantitation Level _e (<i>pql</i>)	Most Stringent Screening Level	
		MTCA Method A (<i>mA</i>)	MTCA Method A Industrial (<i>MAI</i>)	MTCA Method B Direct Contact (most restrictive) (<i>mB</i>)	MTCA Method C Direct Contact (most restrictive) (<i>mC</i>)	Protective of Groundwater (unsaturated) (<i>gwl-u</i>)	Protective of Groundwater (saturated) (<i>gwl-s</i>)				Unsaturated Soil	Saturated Soil
SVOCs	cPAHs _f	0.1	2	0.19 (c)	130 (c)	3.9	0.19	12	-	0.01	3.9 (<i>gwl-u</i>)	0.019 (<i>gwl-s</i>)
	Naphthalene	5	5	1,600	70,000	4.5	0.24	-	-	0.01	4.5 (<i>gwl-u</i>)	0.24 (<i>gwl-s</i>)
	Tributyltin oxide	-	-	24	1,100	2,500	120	-	-	0.004	24 (<i>mB</i>)	
	2-Methylnaphthalene	-	-	320	14,000	1.7	0.088	-	-	0.1	1.7 (<i>gwl-u</i>)	0.088 (<i>gwl-s</i>)
	Acenaphthene	-	-	4,800	210,000	49	2.5	20	-	0.1	20 (<i>tee</i>)	2.5 (<i>gwl-s</i>)
	Acenaphthylene	-	-	-	-	-	-	-	-	0.1	-	-
	Anthracene	-	-	24,000	1,100,000	1,100	57	-	-	0.1	1,100 (<i>gwl-u</i>)	57 (<i>gwl-s</i>)
	Fluorene	-	-	3,200	140,000	51	2.6	30	-	0.1	30 (<i>tee</i>)	2.6 (<i>gwl-s</i>)
	Phenanthrene	-	-	-	-	-	-	-	-	0.1	-	-
	Benz[a]anthracene	-	-	-	-	-	-	-	-	0.1	-	-
	Benzo[a]pyrene	0.1	2	0.19 (c)	130 (c)	3.9	0.19	12	-	0.1	0.1 (<i>mA</i>)	0.19 (<i>gwl-s</i>)
	Benzo[g,h,i]perylene	-	-	-	-	-	-	-	-	0.1	-	-
	Chrysene	-	-	-	-	-	-	-	-	0.1	-	-
	Dibenzo[a,h]anthracene	-	-	-	-	-	-	-	-	0.1	-	-
	Fluoranthene	-	-	3,200	140,000	630	32	-	-	0.1	630 (<i>gwl-u</i>)	32 (<i>gwl-s</i>)
	Indeno[1,2,3-c,d]pyrene	-	-	-	-	-	-	-	-	0.1	-	-
	Pyrene	-	-	2,400	110,000	330	16	-	-	0.1	330 (<i>gwl-u</i>)	16 (<i>gwl-s</i>)

a = cleanup value equals the combined concentrations of both diesel- and oil-range petroleum; b = higher cleanup value may only be used if benzene is not present and the combined concentrations of toluene, ethylbenzene, and xylenes is less than 1% of the gasoline concentration; c = Most stringent criterion for wildlife in WAC 173-340-900 Table 749-3. If the site qualifies for a simplified TEE evaluation, use Table 749-2; d = From Ecology’s Natural Background Soil Metals Concentrations in Washington State (Ecology, 1994); e = Analytical reporting limits as provided by Friedman & Bruya Laboratory of Seattle, Washington. PQLs for tributyltin is based on analytical reporting limits provided by Analytical Resources LLC of Tukwila, WA. f = total cPAH concentration (TEQ) using TEFs for constituent analytes; nox = SL based on non-oxidized tributyltin; - = no CULs are listed in CLARC for the indicated analyte and the indicated CUL category; (c) = value reflects the carcinogenic screening level.



Table 5. Preliminary Contaminant Screening Levels - Groundwater

Analyte		Contaminant Concentrations (µg/L)											
		Potable Water				Non-Potable Water	Vapor Intrusion			Practical Quantitation Level _e (pql)	Most Stringent Screening Levels		
		MTCA Method A Potable (mA)	MTCA Method B Potable (most restrictive) (mB)	Groundwater ARAR – State & Federal MCL, WAC 246-290 & 40 CFR 141 (MCL)	Groundwater ARAR – WA State Secondary MCL, WAC 246-290 (MCL2)	MTCA Method C Industrial Non-potable (most restrictive) (mC)	Protective of Vapor Intrusion (Method B) (VI-B)	Protective of Vapor Intrusion (Commrcl wkr) (VI-com)	Protective of Vapor Intrusion (Method C) (VI-C)		Protective of Potable Water	Protective of Non-Potable Water	Protective of Vapor Intrusion
Total Petroleum Hydrocarbons	Diesel	500 _a	-	-	-	-	-	-	-	50	500 _a (mA)	-	-
	Oil		-	-	-	-	-	-	-	250		-	-
	Gasoline	800/1,000 _b	-	-	-	-	-	-	-	100	800/1,000 _b (mA)	-	-
VOCs	Benzene	5	0.8 (c)	5	-	8 (c)	2.4 (c)	11 (c)	24 (c)	0.02	0.8 (mB)	8 (mC)	2.4 (VI-B)
	Toluene	1,000	640	1,000	-	1,400	15,000	130,000	34,000	1	640 (mB)	1,400 (mC)	15,000 (VI-B)
	Ethylbenzene	700	800	700	-	1,800	2,800	24,000	6,100	1	700 (mA)	1,800 (mC)	2,800 (VI-B)
	Xylenes (m,p,o)	1,000	1,600	10,000	-	3,500	320	2,800	710	3	1,000 (mA)	3,500 (mC)	320 (VI-B)
	Dichlorodifluoromethane	-	1,600	-	-	3,500	4.2	36	9.2	1	1,600 (mB)	3,500 (mC)	4.2 (VI-B)
	Chloromethane	-	-	-	-	-	150	1,300	330	10	-	-	150 (VI-B)
	Vinyl chloride	0.2	0.029 (c)	2	-	0.29 (c)	0.33 (c)	1.6 (c)	3.3 (c)	0.02	0.029 (mB)	0.29 (mC)	0.33 (VI-B)
	Bromomethane	-	11	-	-	25	11	93	24	5	11 (mB)	25 (mC)	11 (VI-B)
	Chloroethane	-	-	-	-	-	-	-	-	1	-	-	-
	Trichlorofluoromethane	-	2,400	-	-	5,300	120	1,000	260	1	2,400 (mB)	5,300 (mC)	120 (VI-B)
	Acetone	-	7,200	-	-	16,000	-	-	-	50	7,200 (mB)	16,000 (mC)	-
	1,1-Dichloroethene	-	400	7	-	880	130	1,100	280	1	7 (MCL)	880 (mC)	130 (VI-B)
	Hexane	-	480	-	-	1,100	7.2	61	16	5	480 (mB)	1,100 (mC)	7.2 (VI-B)
	Methylene chloride	5	5.8 (c)	5	-	110	780 (c)	14,000 (c)	7,100	5	5 (MCL)	110 (mC)	780 (VI-B)
	Methyl t-butyl ether (MTBE)	20	24 (c)	-	-	240	860 (c)	4,000 (c)	8,600 (c)	1	20 (mA)	240 (mC)	860 (VI-B)
	trans-1,2-Dichloroethene	-	160	-	-	350	77	650	170	1	160 (mB)	350 (mC)	77 (VI-B)
	1,1-Dichloroethane	-	7.7 (c)	-	-	77 (c)	11 (c)	52 (c)	110 (c)	1	7.7 (mB)	77 (mC)	11 (VI-B)
	2,2-Dichloropropane	-	-	-	-	-	-	-	-	1	-	-	-
	cis-1,2-Dichloroethene	-	16	7	-	35	180	1,600	400	1	7 (MCL)	35 (mC)	180 (VI-B)
	Chloroform	-	1.4 (c)	80	-	14 (c)	1.2 (c)	5.5 (c)	12 (c)	1	1.4 (mB)	14 (mC)	1.2 (VI-B)
	2-Butanone (MEK)	-	4,800	-	-	11,000	1,700,000	15,000,000	3,700,000	20	4,800 (mB)	11,000 (mC)	1,700,000 (VI-B)
	1,2-Dichloroethane (EDC)	5	0.48 (c)	5	-	4.8	3.5 (c)	16 (c)	35 (c)	0.2	0.48 (mB)	4.8 (mC)	3.5 (VI-B)
	1,1,1-Trichloroethane	200	16,000	200	-	35,000	5,400	46,000	12,000	1	200 (MCL)	35,000 (mC)	5,400 (VI-B)
	1,1-Dichloropropene	-	-	-	-	-	-	-	-	1	-	-	-
	Carbon tetrachloride	-	0.63 (c)	5	-	6.3 (c)	0.62 (c)	2.9 (c)	6.2 (c)	0.5	0.63 (mB)	6.3 (mC)	0.62 (VI-B)
	Trichloroethene	5	0.54 (c)	5	-	8.8	1.4 (c)	12 (c)	8.6	0.5	0.54 (mB)	8.8 (mC)	1.4 (VI-B)
	1,2-Dichloropropane	-	1.2 (c)	5	-	12 (c)	10 (c)	48 (c)	61	1	1.2 (mB)	12 (mC)	10 (VI-B)
	Bromodichloromethane	-	0.71 (c)	80	-	7.1 (c)	1.4 (c)	6.4 (c)	1,400 (c)	0.5	0.71 (mB)	7.1 (mC)	1.4 (VI-B)
	Dibromomethane	-	80	-	-	180	-	-	-	1	80 (mB)	180 (mC)	-
	4-Methyl-2-pentanone	-	640	-	-	1,400	470,000	4,000,000	1,000,000	10	640 (mB)	1,400 (mC)	470,000 (VI-B)
	cis-1,3-Dichloropropene	-	-	-	-	-	-	-	-	0.4	-	-	-
	trans-1,3-Dichloropropene	-	-	-	-	-	-	-	-	0.4	-	-	-



Table 5. Preliminary Contaminant Screening Levels – Groundwater (continued)

Analyte		Contaminant Concentrations (µg/L)											
		Potable Water				Non-Potable Water	Vapor Intrusion			Practical Quantitation Level _e (pql)	Most Stringent Screening Levels		
		MTCA Method A Potable (mA)	MTCA Method B Potable (most restrictive) (mB)	Groundwater ARAR – State & Federal MCL, WAC 246-290 & 40 CFR 141 (MCL)	Groundwater ARAR – WA State Secondary MCL, WAC 246-290 (MCL2)	MTCA Method C Industrial Non-potable (most restrictive) (mC)	Protective of Vapor Intrusion (Method B) (VI-B)	Protective of Vapor Intrusion (Commrcl wkr) (VI-com)	Protective of Vapor Intrusion (Method C) (VI-C)		Protective of Potable Water	Protective of Non-Potable Water	Protective of Vapor Intrusion
VOCs	cis-1,3-Dichloropropene	-	-	-	-	-	-	-	0.4	-	-	-	
	trans-1,3-Dichloropropene	-	-	-	-	-	-	-	0.4	-	-	-	
	1,1,2-Trichloroethane	-	0.77 (c)	5	-	7.7 (c)	5.1	41 (c)	11	0.5	0.77 (mB)	7.7 (mC)	5.1 (VI-B)
	2-Hexanone	-	40	-	-	88	7,300	62,000	16,000	10	40 (mB)	88 (mC)	7,300 (VI-B)
	1,3-Dichloropropane	-	160	-	-	350	-	-	-	1	160 (mB)	350 (mC)	-
	Tetrachloroethene	5	21 (c)	5	-	110	25 (c)	120 (c)	100	1	5 (MCL)	110 (mC)	25 (VI-B)
	Dibromochloromethane	-	0.52 (c)	80	-	5.2 (c)	-	-	-	0.5	0.52 (mB)	5.2 (mC)	-
	1,2-Dibromoethane (EDB)	0.01	0.022 (c)	0.05	-	0.22 (c)	0.3 (c)	1.4 (c)	3 (c)	0.01	0.01 (mA)	0.22 (mC)	0.3 (VI-B)
	Chlorobenzene	-	160	-	-	350	340	2,900	750	1	160 (mB)	350 (mC)	340 (VI-B)
	1,1,1,2-Tetrachloroethane	-	1.7 (c)	-	-	17 (c)	7.1 (c)	33 (c)	71 (c)	1	1.7 (mB)	17 (mC)	7.1 (VI-B)
	Styrene	-	1,600	100	-	3,500	8,500	7,300	19,000	1	100 (MCL)	3,500 (mC)	7,300 (VI-com)
	Isopropylbenzene	-	800	-	-	1,800	-	-	-	1	800 (mB)	1,800 (mC)	-
	Bromoform	-	5.5 (c)	80	-	55 (c)	220 (c)	1,000 (c)	2,200 (c)	5	5.5 (mB)	55 (mC)	220 (VI-B)
	n-Propylbenzene	-	800	-	-	1,800	2,300	19,000	4,900	1	800 (mB)	1,800 (mC)	2,300 (VI-B)
	Bromobenzene	-	64	-	-	140	630	5,400	1,400	1	64 (mB)	140 (mC)	630 (VI-B)
	1,3,5-Trimethylbenzene	-	80	-	-	180	170	1,400	370	1	80 (mB)	180 (mC)	170 (VI-B)
	1,1,1,2,2-Tetrachloroethane	-	0.22 (c)	-	-	2.2	5.9 (c)	27 (c)	59 (c)	0.2	0.22 (mB)	2.2 (mC)	5.9 (VI-B)
	2-Chlorotoluene	-	160	-	-	350	-	-	-	1	160 (mB)	350 (mC)	-
	4-Chlorotoluene	-	160	-	-	350	-	-	-	1	160 (mB)	350 (mC)	-
	tert-Butylbenzene	-	800	-	-	1,800	-	-	-	1	800 (mB)	1,800 (mC)	-
	1,2,4-Trimethylbenzene	-	80	-	-	180	240	2,000	520	1	80 (mB)	180 (mC)	240 (VI-B)
	sec-Butylbenzene	-	800	-	-	1,800	-	-	-	1	800 (mB)	1,800 (mC)	-
	p-Isopropyltoluene	-	-	-	-	-	-	-	-	1	-	-	-
	1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	1	-	-	-
	1,4-Dichlorobenzene	-	8.1 (c)	75	-	81 (c)	5 (c)	23 (c)	50 (c)	1	8.1 (mB)	81 (mC)	5 (VI-B)
	1,2-Dichlorobenzene	-	720	600	-	1,600	2,500	21,000	5,500	1	600 (MCL)	1,600 (mC)	2,500 (VI-B)
	1,2,4-Trichlorobenzene	-	1.5 (c)	70	-	15 (c)	39	330	84	1	1.5 (mB)	15 (mC)	39 (VI-B)
	Hexachlorobutadiene	-	0.56 (c)	-	-	5.6 (c)	0.64 (c)	3 (c)	6.4 (c)	0.5	0.56 (mB)	5.6 (mC)	0.64 (VI-B)
	1,2,3-Trichlorobenzene	-	6.4	-	-	14	-	-	-	1	6.4 (mB)	14 (mC)	-
PCBs	Aroclor 1016	-	0.56	-	-	1.2	-	-	-	0.01	0.56 (mB)	1.2 (mC)	-
	Aroclor 1254	-	0.022 (c)	-	-	0.22 (c)	-	-	-	0.01	0.022 (mB)	0.22 (mC)	-
	Aroclor 1260	-	0.022 (c)	-	-	0.22 (c)	-	-	-	0.01	0.022 (mB)	0.22 (mC)	-
	Total PCBs	0.1	0.022 (c)	0.5	-	0.22 (c)	-	-	-	0.01	0.022 (mB)	0.22 (mC)	-



Table 5. Preliminary Contaminant Screening Levels – Groundwater (continued)

Analyte		Contaminant Concentrations (µg/L)											
		Potable Water				Non-Potable Water	Vapor Intrusion			Practical Quantitation Level _e (pql)	Most Stringent Screening Levels		
		MTCA Method A Potable (mA)	MTCA Method B Potable (most restrictive) (mB)	Groundwater ARAR – State & Federal MCL, WAC 246-290 & 40 CFR 141 (MCL)	Groundwater ARAR – WA State Secondary MCL, WAC 246-290 (MCL2)	MTCA Method C Industrial Non-potable (most restrictive) (mC)	Protective of Vapor Intrusion (Method B) (VI-B)	Protective of Vapor Intrusion (Commrcl wkr) (VI-com)	Protective of Vapor Intrusion (Method C) (VI-C)		Protective of Potable Water	Protective of Non-Potable Water	Protective of Vapor Intrusion
Metals	Arsenic	5	0.058 (c)	10	-	0.58 (c)	-	-	-	1	1 (pql)	1 (pql)	-
	Cadmium	5	8	5	-	18	-	-	-	1	5 (MCL)	18 (mC)	-
	Total Chromium	50	-	100	-	-	-	-	-	1	50 (mA)	-	-
	Lead	15	-	15	-	-	-	-	-	1	15 (mA)	-	-
	Mercury	2	-	2	-	-	-	-	-	0.01	2 (mA)	-	-
	Copper	-	640	1,300	-	1,400	-	-	-	5	640 (mB)	1,400 (mC)	-
	Zinc	-	4,800	-	5,000	11,000	-	-	-	5	4,800 (mB)	11,000 (mC)	-
SVOCs	cPAHs _f	0.1	0.023 (c)	0.2	-	0.88 (c)	-	-	-	0.02	0.023 (mB)	0.88 (mC)	-
	Naphthalene	160	160	-	-	350	8.8 (c)	41 (c)	88 (c)	0.2	160 (mB)	350 (mC)	8.8 (VI-B)
	Tributyltin oxide	-	4.8	-	-	11	-	-	-	0.2	4.8 (mB)	11 (mC)	-
	2-Methylnaphthalene	-	32	-	-	70	-	-	-	0.2	32 (mB)	70 (mC)	-
	Acenaphthene	-	480	-	-	1,100	-	-	-	0.02	480 (mB)	1,100 (mC)	-
	Acenaphthylene	-	-	-	-	-	-	-	-	0.02	2,400 (mB)	-	-
	Anthracene	-	2,400	-	-	5,300	-	-	-	0.02	320 (mB)	5,300 (mC)	-
	Fluorene	-	320	-	-	700	-	-	-	0.02	-	700 (mC)	-
	Phenanthrene	-	-	-	-	-	-	-	-	0.02	-	-	-
	Benz[a]anthracene	-	-	-	-	-	-	-	-	0.02	-	-	-
	Benzo[a]pyrene	0.1	0.023 (c)	0.2	-	0.88 (c)	-	-	-	0.02	0.023 (mB)	0.88 (mC)	-
	Benzo[g,h,i]perylene	-	-	-	-	-	-	-	-	0.04	-	-	-
	Chrysene	-	-	-	-	-	-	-	-	0.02	-	-	-
	Dibenzo[a,h]anthracene	-	-	-	-	-	-	-	-	0.02	-	-	-
	Fluoranthene	-	640	-	-	1,400	-	-	-	0.02	640 (mB)	1,400 (mC)	-
	Indeno[1,2,3-c,d]pyrene	-	-	-	-	-	-	-	-	0.02	-	-	-
	Pyrene	-	240	-	-	530	-	-	-	0.02	240 (mB)	530 (mC)	-

a = cleanup value equals the combined concentrations of both diesel- and oil-range petroleum; b = higher cleanup value may only be used if benzene is not present and the combined concentrations of toluene, ethylbenzene, and xylenes is less than 1% of the gasoline concentration; e = Analytical reporting limits as provided by Friedman & Bruya Laboratory of Seattle, Washington. PQLs for tributyltin is based on analytical reporting limits provided by Analytical Resources LLC of Tukwila, WA. f = total cPAH concentration (TEQ) using TEFs for constituent analytes; - = no CULs are listed in CLARC for the indicated analyte and the indicated CUL category.



8.7 Timeline

An estimated timetable of proposed work activities is provided in Table 5, below.

The proposed timeline is based upon an estimated final work plan approval date. If work plan review, cultural resources assessments, or other project elements delay the start of field activities, the timetable will continue to provide our anticipated order of events and relative timing.

This timetable assumes that standard turnaround times for sample analysis will be used. Timetable dates are subject to subcontractor availability for drilling portions of the project.

Table 6. Estimated Project Timetable

Task	Approximate Date of Completion
Agreed Order finalized	June 28, 2024 [^]
Initial Submittal of work plan to Ecology for review	August 9, 2024 [^]
Ecology comments on work plan	September 6, 2024 [^]
Work plan re-submittal to Ecology for final approval	January 9, 2025 [^]
30-day cultural resources comment period	November 19-December 19, 2024
Cultural resources permitting (if needed)	December 2024
Ecology approval of work plan	January 15, 2025
GPR & private utility locate	February 10, 2025*
Drill borings for soil and reconnaissance groundwater samples	February 11-14, 2025*
Receive sample analytical results	February 28, 2025
Preliminary Draft Remedial Investigation report	April 4, 2025

[^]Project element has been completed and noted date indicates completion date.

*Start timing of field activities dependent upon work plan and cultural resources permit approval, driller availability, Stratum Group personnel availability, and coordination for cultural resources oversight, if needed.

8.8 Quality Control/Quality Assurance

Quality control and quality assurance protocols will be implemented for this investigation in accordance with the QAPP provided in Appendix VI.

8.9 Reporting

Upon completion of the upland remedial investigation tasks, Stratum Group will prepare a Preliminary Draft Remedial Investigation report in general accordance with WAC 173-340-350. This report will document and summarize the results of recent environmental sampling, including sample data, maps showing the spatial distribution of the results, comparison of sample analysis results to initial screening concentrations (MTCA Method A), and a re-evaluation of



Site contaminants of concern and the Site's conceptual model. The Preliminary Draft remedial investigation report will include a Terrestrial Ecological Evaluation (TEE) for the Site, completed in accordance with WAC 173-340-7490. The results of the TEE, our initial sampling work, and the available future Site improvement plans will be used to determine if additional investigation activities are warranted and begin development of Site-specific CULs.

Additional draft Remedial Investigation reports will be prepared to document additional Site characterization efforts (see Section 9.0 below), as needed.

All RI reports will be submitted to Ecology for review.

8.10 Data Submission

All data collected during this remedial investigation and previously collected sample data will be entered into Ecology's Environmental Information Management (EIM) system.

8.11 Management of Investigation Derived Waste (IDW)

All soil and water generated from environmental borings that is not used for sample analysis purposes will be placed in labeled 55-gallon drums and stored on-site pending characterization. We anticipate this waste will be stored on-site until cleanup activities commence, at which time the soil and water will be disposed of with soil and water removed during remediation. Disposal receipts will be obtained to verify proper disposal.

Waste personal protective equipment (e.g., gloves) and field supplies (e.g., plastic bags for PID testing) will be bagged and disposed of as general solid waste at the end of each field day.

9.0 Future Work

It is our understanding that GCH has plans to modernize the Site. Many of these plans are in the design phase and are anticipated to move forward in the near future. Further characterization of contamination across the Site and implementation of the most effective cleanup actions will be completed in concert with these projects.

As Site improvement plans materialize into their final forms, we recommend preparation of project-specific work plans to determine outstanding data gaps and appropriate additional Site characterization needs within the impacted areas. These project-specific work plans will help determine the most effective cleanup solutions for the given project area. This will allow Site modernization improvements and remediation to proceed as efficiently as possible and with minimal disruption to existing business activities. Project-specific work plans and cleanup action plans will be submitted to Ecology for review.

Many of these proposed interim improvement activities are likely to involve demolition of



January 15, 2025

Lovric's Sea-Craft, Anacortes, WA

Remedial Investigation Work Plan – Upland Areas

existing buildings and significant disturbance and excavation of existing Site soil, much of which is human-derived fill. We recommend that soil that is excavated and planned to be removed from the Site should be sampled by an environmental professional for characterization to determine whether special disposal methods are required.

GCH is in the process of developing a dredging plan to increase water depths inside the commercial harbor portion of the Site. As discussed above, contamination has been shown to be present within shallow, unconsolidated sediment in the commercial harbor area.

The extent of sediment contamination in the submerged portions of the Site remains insufficiently characterized at this time. However, management and remediation of Site sediments is intertwined with the proposed dredging of the Site, which is subject to a specific set of requirements and timelines. Therefore, a separate work plan will be developed for completing characterization of sediment contamination and determining how to manage and dispose of dredge spoils in coordination with proposed dredging work.



10.0 REFERENCES

Washington State Department of Ecology, 2016. *Guidance for Remediation of Petroleum Contaminated Sites*. Toxics Cleanup Program Publication No. 10-09-057. June 2016.

Washington State Department of Ecology, 2023. *Guidance for Silica Gel Cleanup in Washington State*. Toxics Cleanup Program Publication No. 22-09-059. November 2023.

Stratum Group, 2021. *Environmental Site Assessment: Phase I*. Stratum Group, September 29, 2021.

Stratum Group, 2022. *Environmental Site Assessment: Limited Phase II*. Stratum Group, September 29, 2022.



APPENDIX I

Figure 1-1 – Site Vicinity Map

Figure 1-2 – Annotated Aerial Photograph

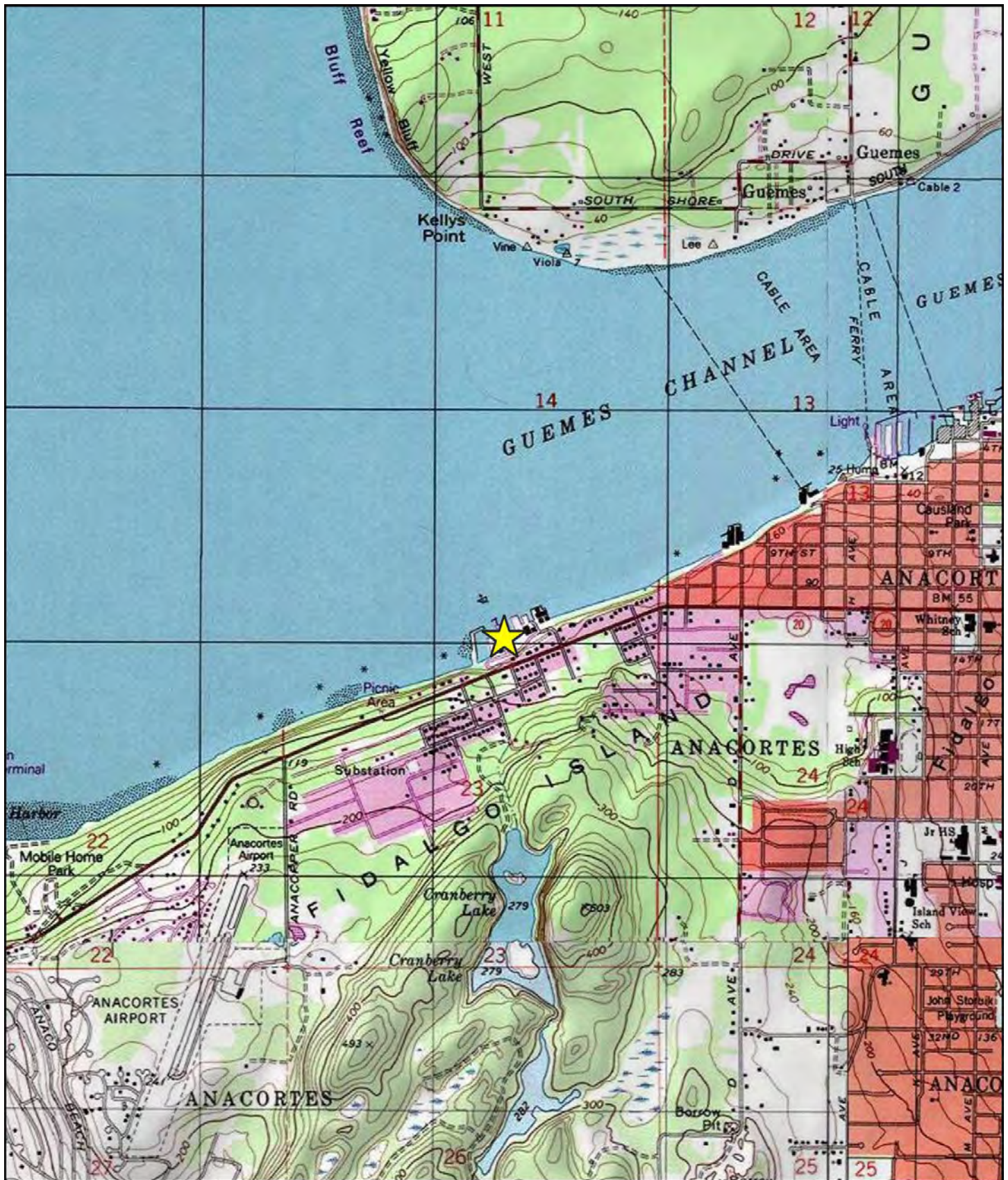
Figure 1-3 – Annotated Site Map and Areas of Environmental Concern

Figure 1-4 – Schematic Conceptual Site Model

Figure 1-5 –Proposed RI Sampling Locations (East)

Figure 1-6 –Proposed RI Sampling Locations (West)

Photos of Current Site Conditions



Subject Property

Site Vicinity Map

Lovric's Sea-Craft
3022 Oakes Avenue
Anacortes, WA 98221

Figure 1-1

0 0.25 0.5 mi



N



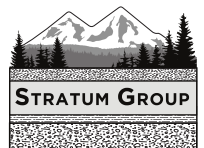


Annotated Aerial Photograph of
the Subject Property & Vicinity

Lovric's Sea-Craft
3100 Oakes Avenue
Anacortes, Washington 98221

Figure 1-2

0 125 250 500 Feet





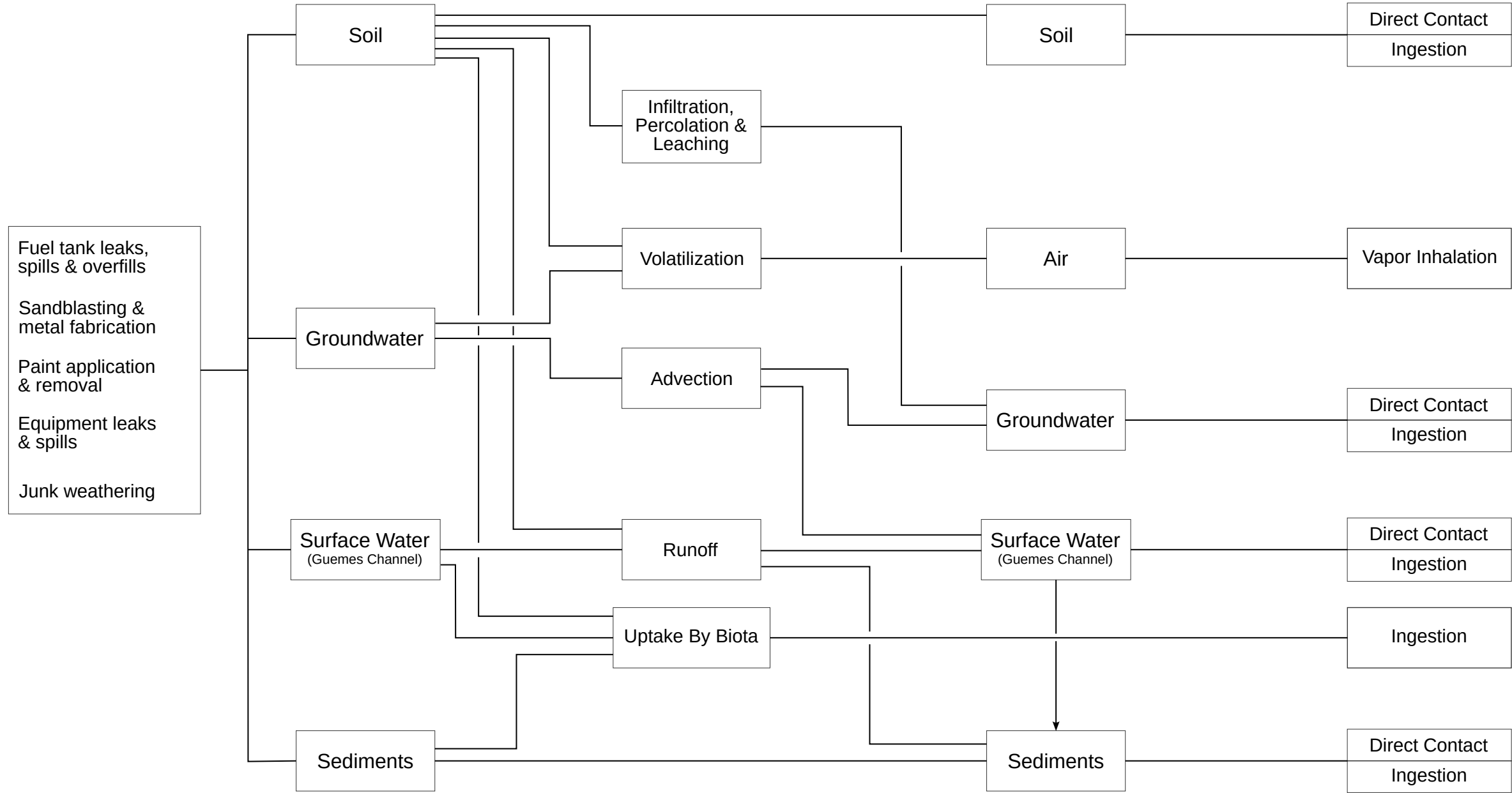
Annotated Site Map &
Areas of Environmental Concern

Figure 1-3

Lovric's Sea-Craft Site
3100 Oakes Avenue
Anacortes, Washington 98221



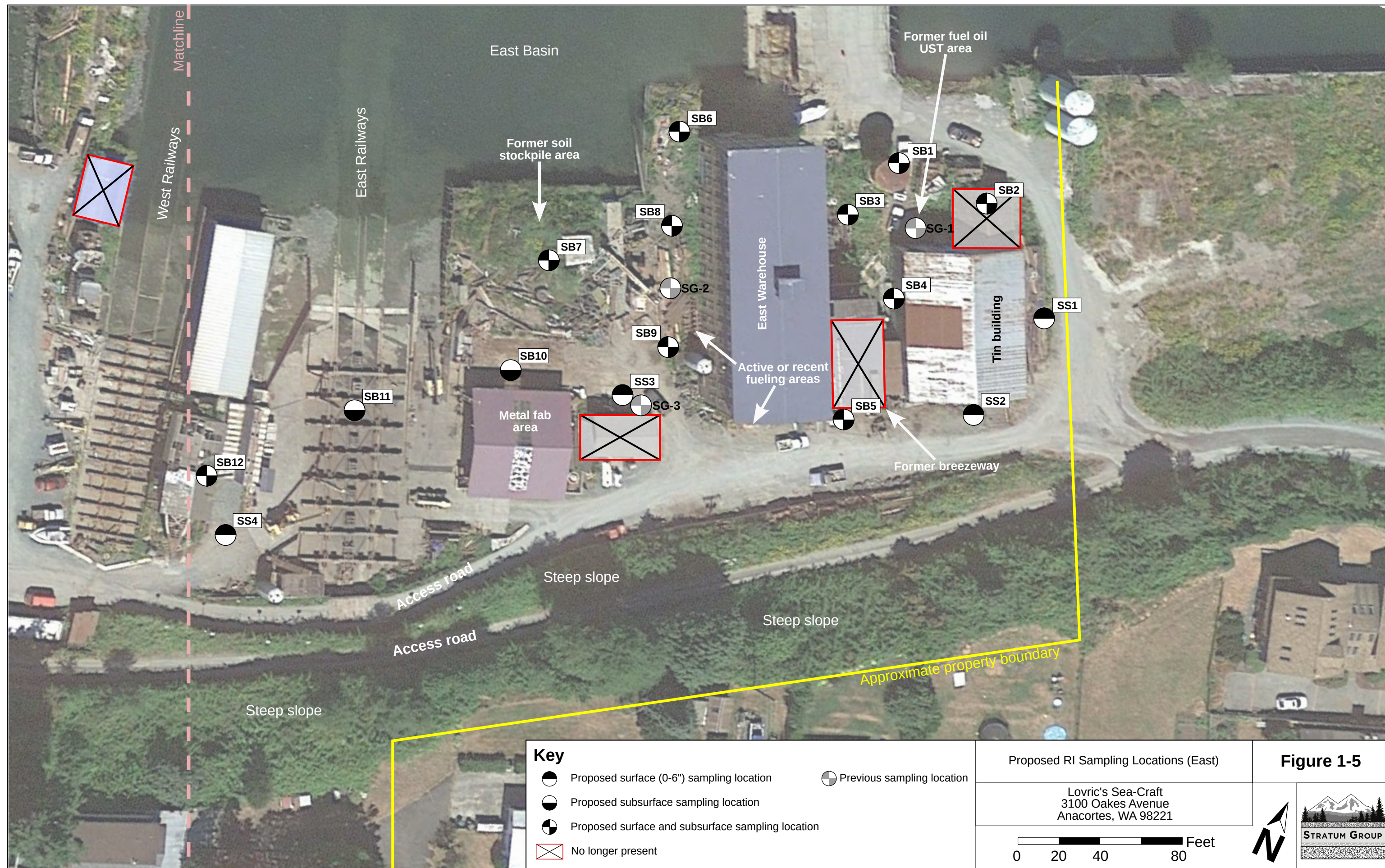
Primary Sources → Secondary Sources → Transport Mechanisms → Tertiary Sources → Exposure Pathways →



Key

- Exposure pathway incomplete
- ⊖ Exposure pathway complete with negligible risk
- ◐ Exposure pathway potentially complete (requires further assessment, a maintained cap, or restrictive covenant)
- Exposure pathway complete

Potential Receptors					
Recreational Marina Occupant	Human		Ecological		
	Commercial & Construction Workers	Tribal fisher & seafood consumer	Terrestrial	Aquatic	
Direct Contact Ingestion	● ●	● ●	○ ○	● ●	○ ○
Vapor Inhalation	○	◐	○	○	○
Direct Contact Ingestion	○ ◐	● ◐	○ ○	○ ○	○ ○
Direct Contact Ingestion	● ⊖	● ⊖	● ●	● ●	● ●
Ingestion	○	○	●	●	●
Direct Contact Ingestion	● ●	● ⊖	○ ○	● ●	○ ○





Key

- Proposed surface (0-6") sampling location
- ◐ Proposed subsurface sampling location
- ◑ Proposed surface and subsurface sampling location
- ⊠ No longer present
- ◐ Previous sampling location

Proposed RI Sampling Locations (West)		Figure 1-6 STRATUM GROUP
Lovric's Sea-Craft 3100 Oakes Avenue Anacortes, WA 98221		
0 20 40 80 Feet		

Photos of Current Site Conditions
(March 15, 2024, unless otherwise noted)



Soil stockpile at the base of the main (west) driveway, looking west.



Two pipes that discharge water from off-site onto the west end of the subject property.



Culvert that collects the water from small waterway formed by the flow from the two pipes up slope and discharges it onto the beach along Guemes Channel.



View of the recreational marina parking at the west warehouse, looking east.



Mid-slope bench location of former trailer and derelict vehicle storage on the west end of the property, now cleared. Looking west.



Storage area underlain by a beached barge along the west side of the west warehouse, looking north.



The front of the west warehouse, looking northeast.



Remaining hazardous waste stored in the west warehouse awaiting disposal by WasteXpress.



View underneath the west warehouse taken by Reid Middleton engineers (6/30/2022).



Additional view underneath the west warehouse taken by Reid Middleton engineers (6/30/2022).



View of the west warehouse, looking west. The western marine railway is in the right side of the photo.



New office container with adjacent tank to be used for sewage storage.



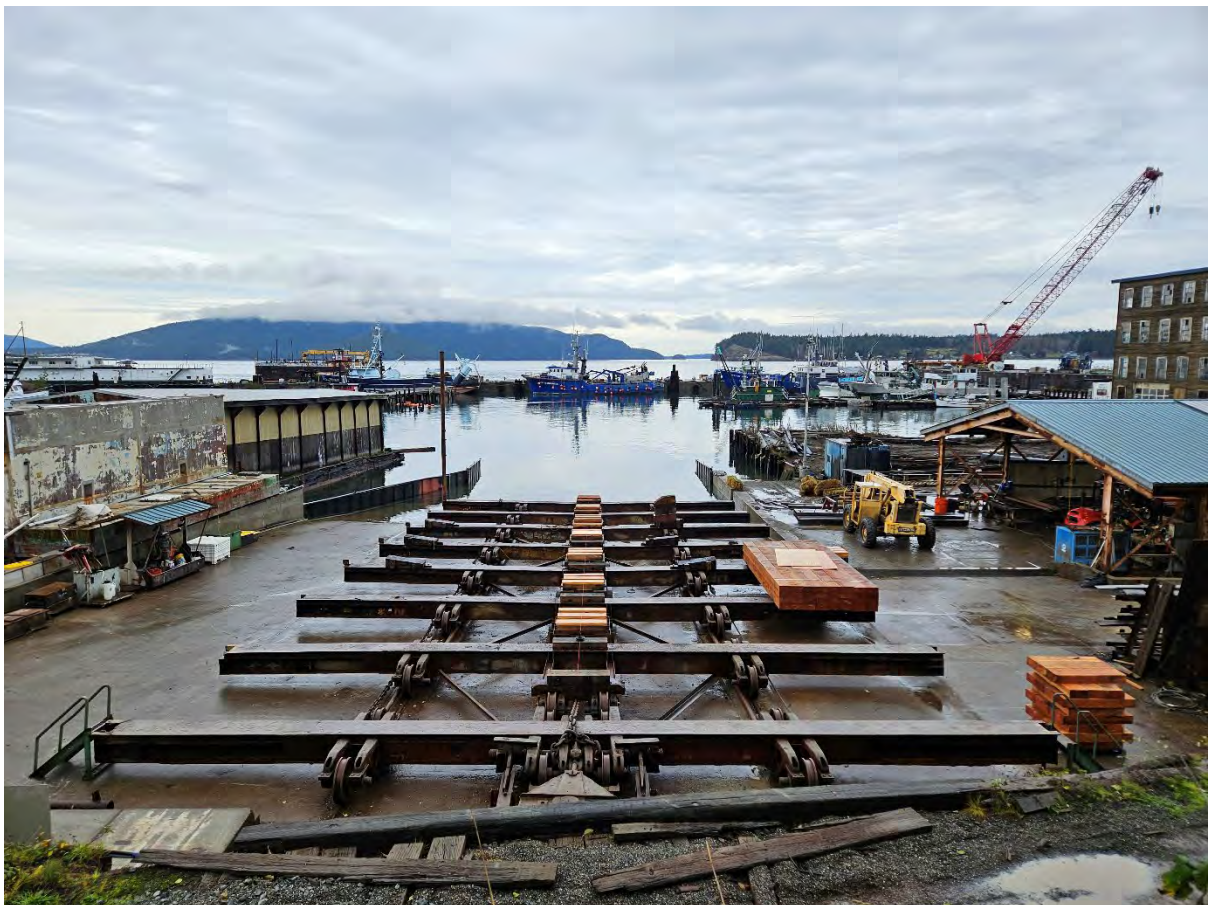
Location of the former paint storage shed northeast of the west warehouse.



View of the center peninsula northeast of the west warehouse, looking northeast.



View of the west marine railways. Note the partially sunken barge (former wood shop) to the right.



View of the east marine railways, looking north (12/5/2023).



Ship actively being painted and repaired on the east railways.



Ship being actively painted and repaired on the east railways. Note the stormwater/process water retention gates in use.



View across the metal fabrication shed and former soil stockpile area (beyond the shed), looking northwest.



View of the marine railways area from the outer dock, looking south (12/5/2023).



View of the west side of the east warehouse, looking south towards the metal fabrication shed.



The current fueling area on the south side of the east warehouse.



Additional fuel tanks (not active) stored on the west side of the east warehouse.



Slope mostly cleared of vegetation between the main shorefront work area and the mid-slope access road.



View of the former soil stockpile area (removed in 2023), looking westward.



The east warehouse building, looking northwest. The tin building is in the right edge of the photo.



Dumpster with former waste oil storage tank between the east warehouse and tin building.



The storage tank inside the dumpster with an unknown fluid pooled in the bottom.



The front of the tin building, looking northwest.



View of the east side of the tin building, looking north. Lovric's eastern property boundary extends through the gravel driveway in this photo.



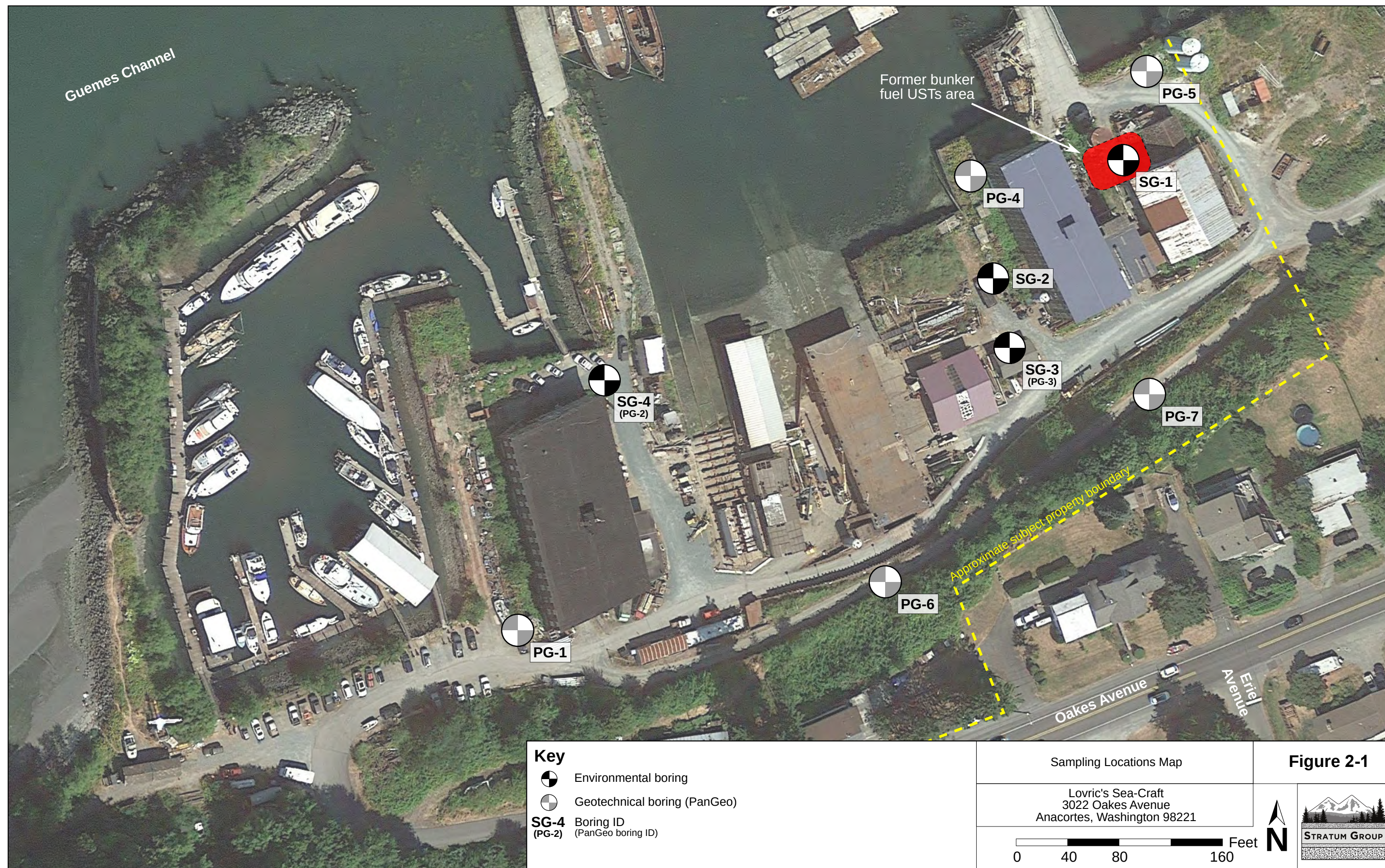
Drums of new and used oil and hydraulic fluid, and used filters and rags stored inside the tin building.

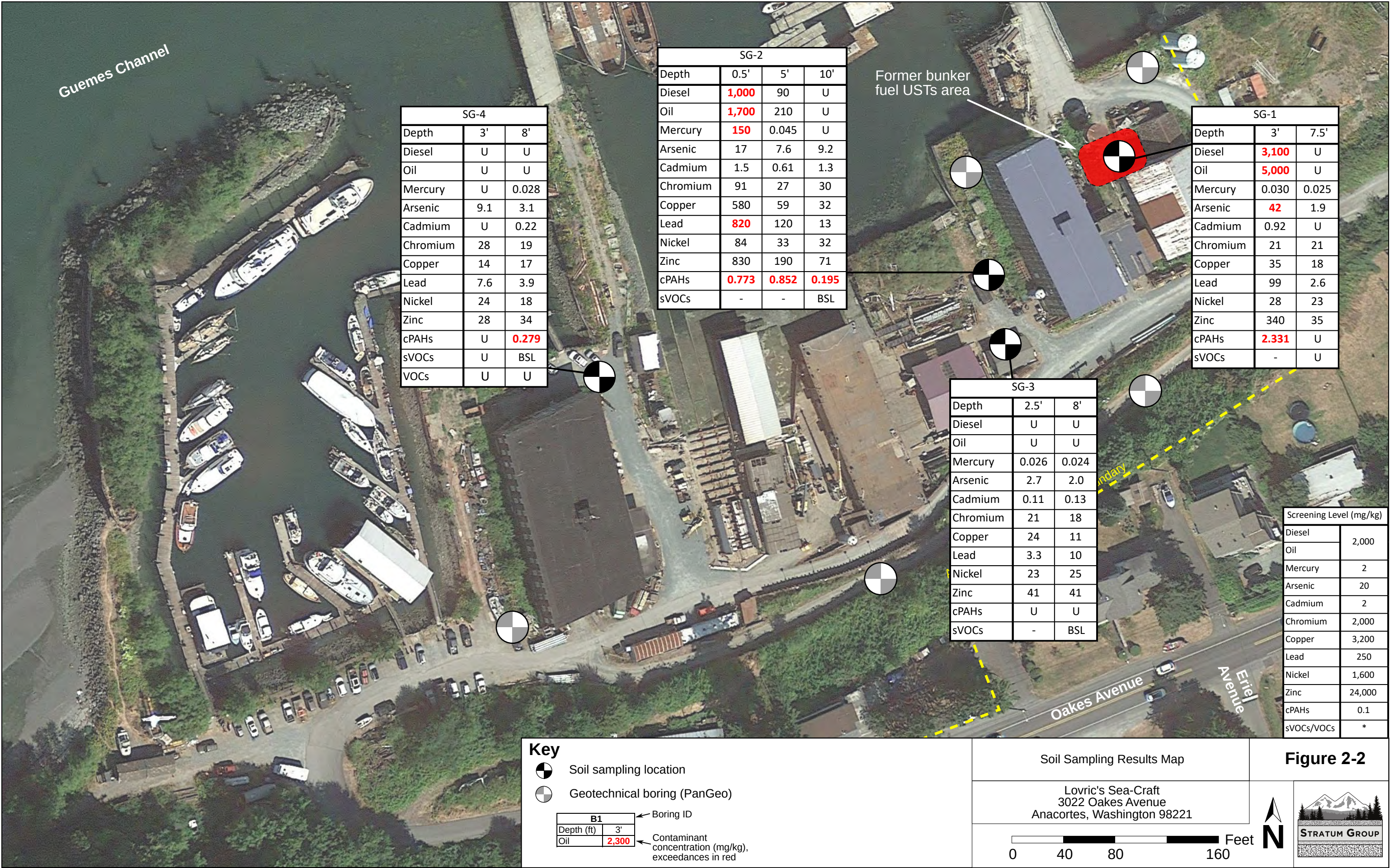
APPENDIX II – PHASE II ESA SAMPLING LOCATIONS & RESULTS

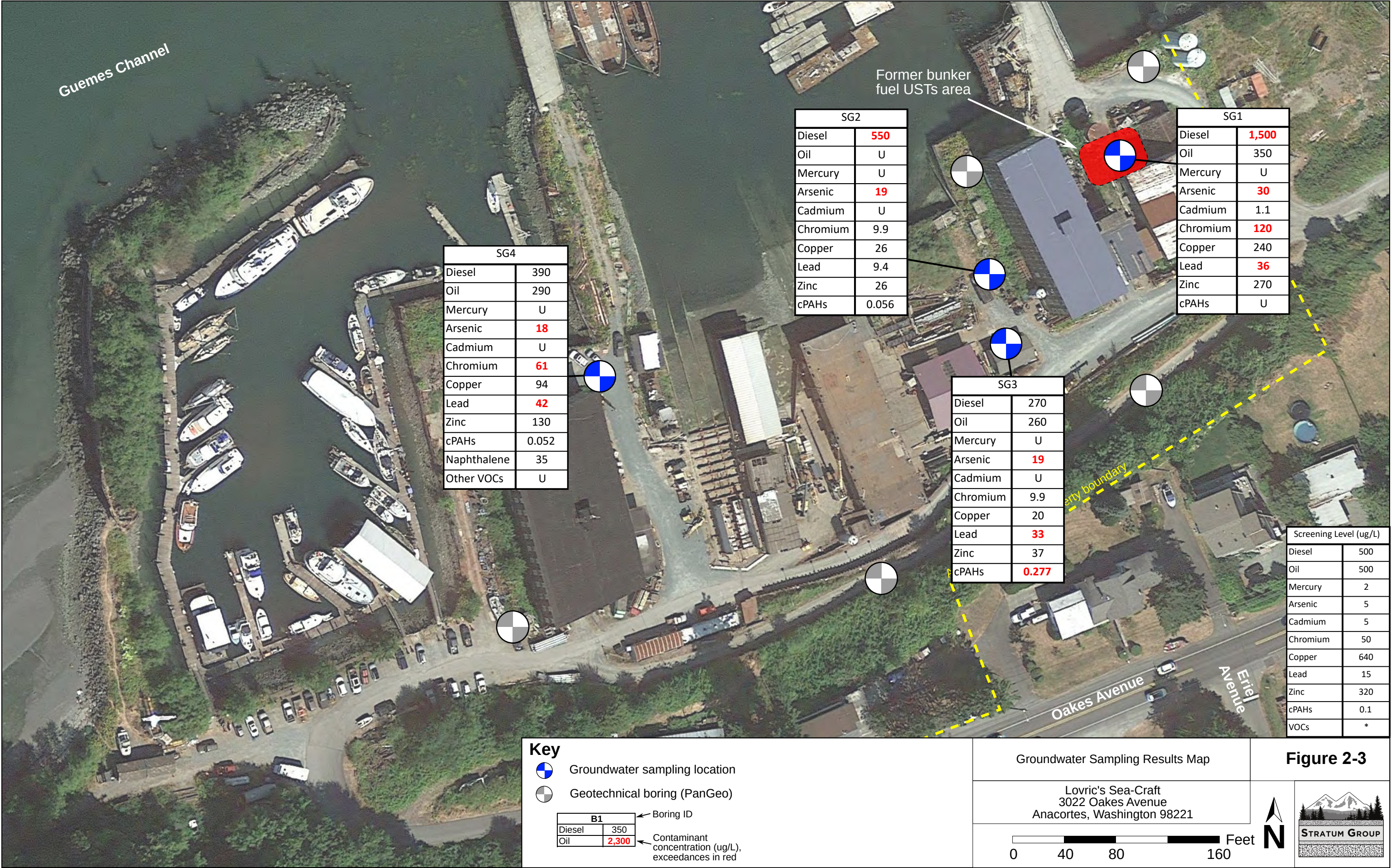
Figure 2-1 – Sampling Locations Map

Figure 2-2 – Soil Sampling Results Map

Figure 2-3 – Groundwater Sampling Results Map







APPENDIX III – EAST PIER SEDIMENT SAMPLING

Figure 3-1 – Map of Sediment Sampling Results (Metals)

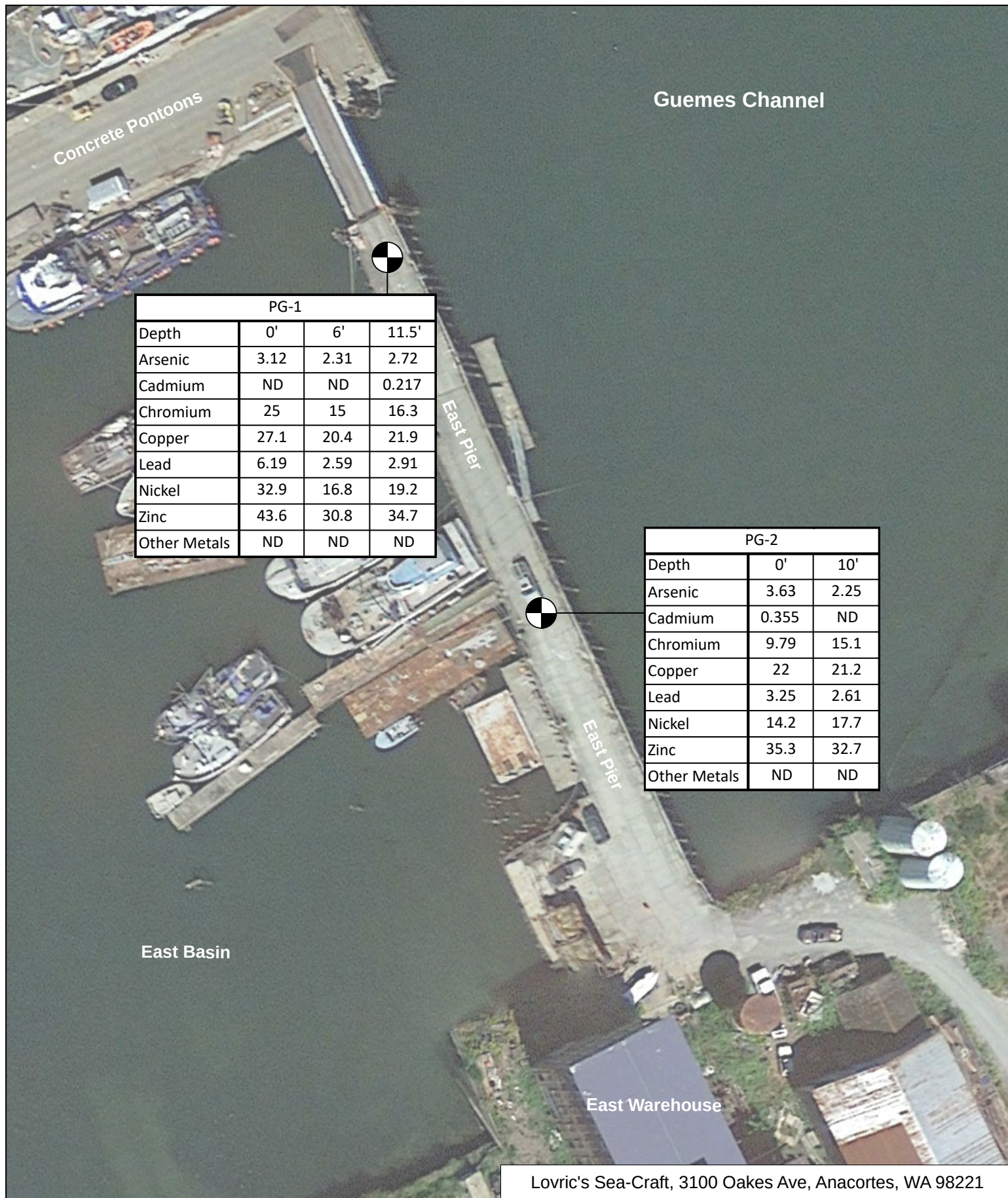
Figure 3-2– Map of Sediment Sampling Results (PAHs)

Figure 3-3 – Map of Sediment Sampling Results (Other COCs)

Table 3-1 – East Pier Sediment Sampling Results

Site Photos of East Pier Sediment Sampling

Laboratory Report & Chain-of-Custody



Key



Sampling location

Bold & red = exceeds DMMP screening level. ND = non-detect

Lovric's Sea-Craft, 3100 Oakes Ave, Anacortes, WA 98221

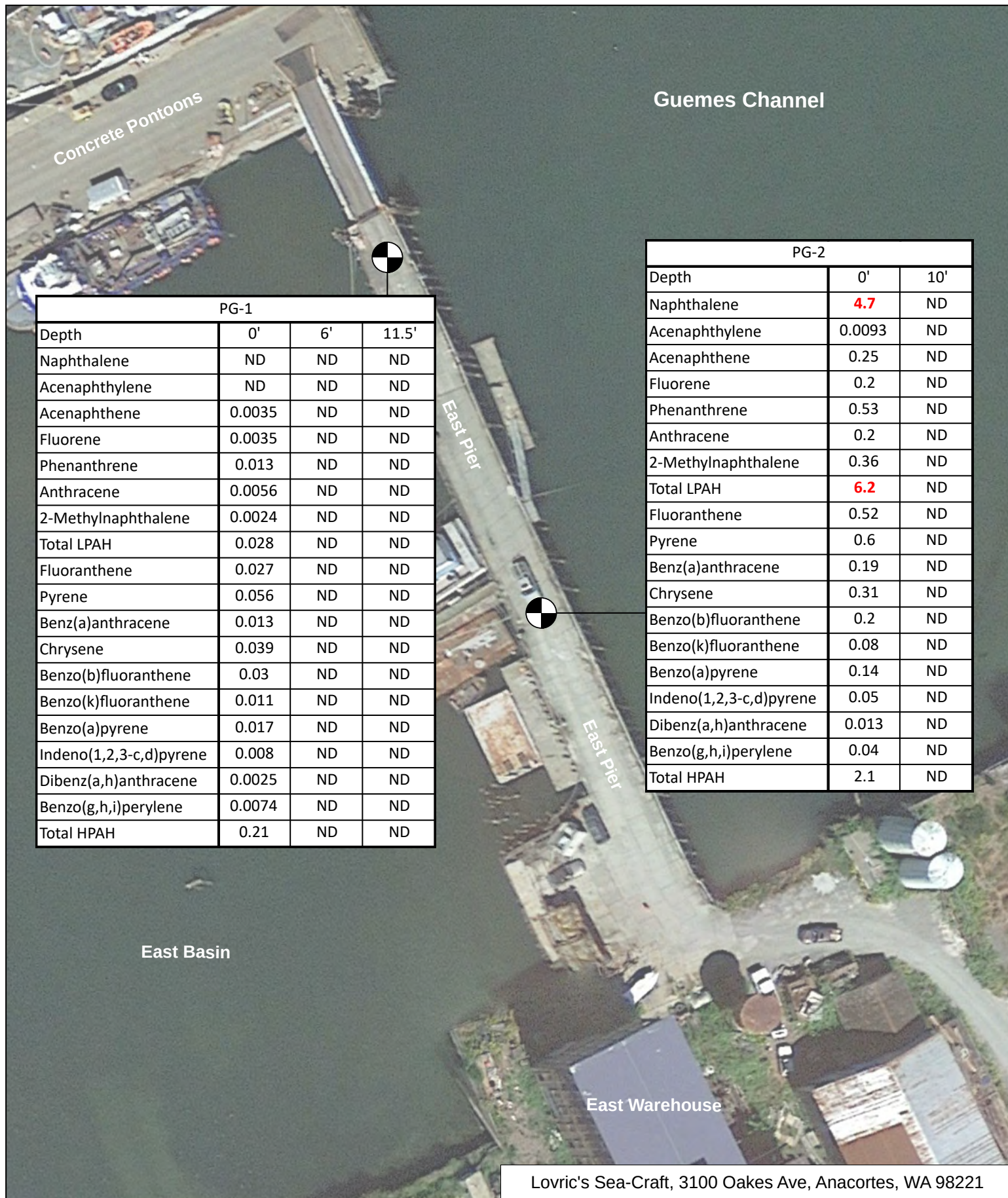
Figure 3-1

Map of Sediment
Sampling Results -
Metals



0 25 50 100 Feet





Lovric's Sea-Craft, 3100 Oakes Ave, Anacortes, WA 98221

Key



Sampling location

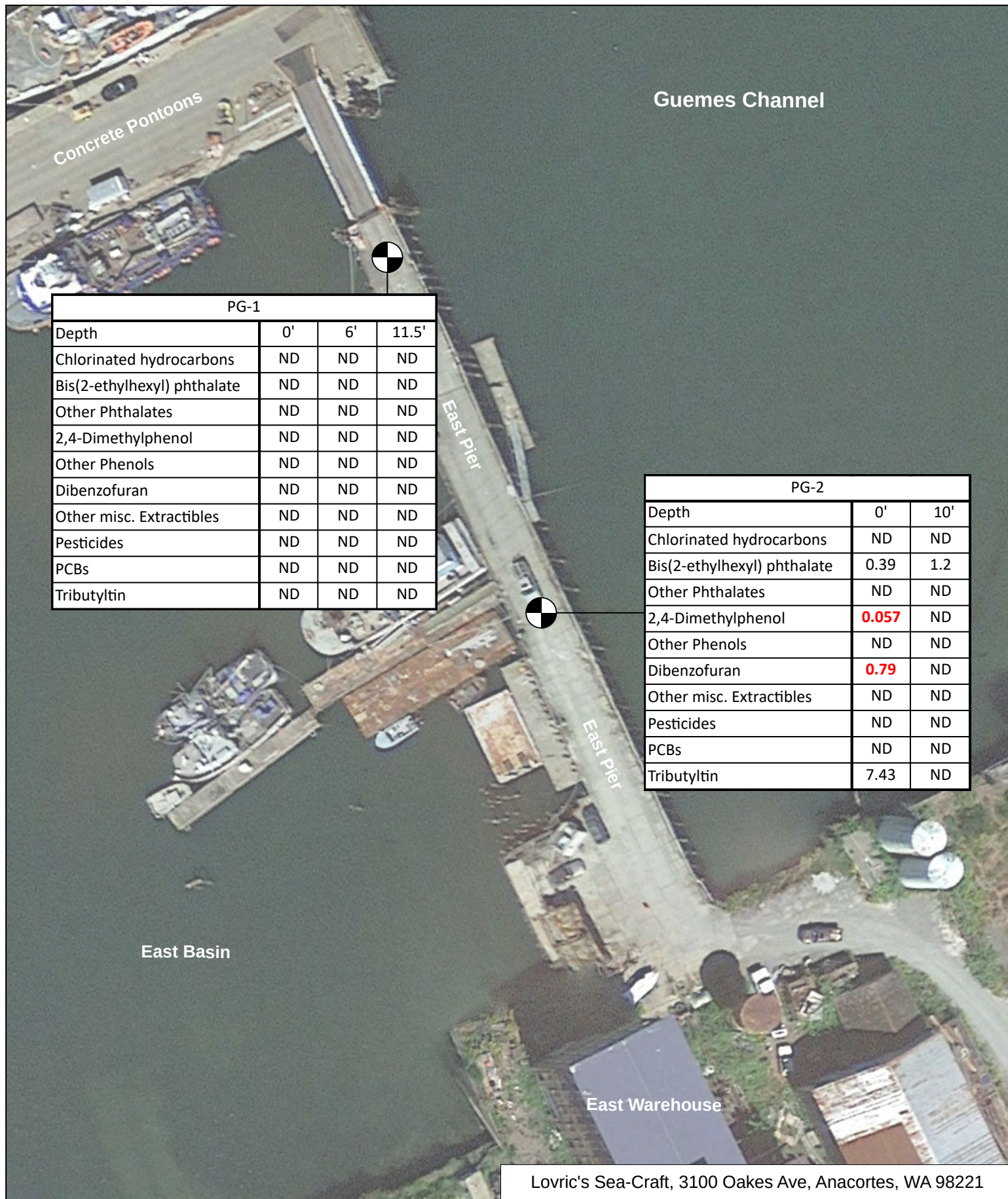
Figure 3-2

Map of Sediment
Sampling Results -
PAHs



0 25 50 100 Feet

Bold & red = exceeds DMMP screening level. ND = non-detect



Lovric's Sea-Craft, 3100 Oakes Ave, Anacortes, WA 98221

Key



Sampling location

Figure 3-3

Map of Sediment
Sampling Results -
Other COCs



0 25 50 100 Feet



Bold & red = exceeds DMMP screening level. ND = non-detect

Table 3-1 – East Pier Sediment Sampling Results

Boring	DMMP Screening Level	PG-1			PG-2	
Sample Name		PG1-0	PG1-6	PG1-11.5	PG2-0	PG2-10
Sample Depth		0'	6'	11.5'	0'	10'
Sampling Date		4/24/23	4/24/23	4/24/23	4/25/23	4/25/23
Conventional Parameters						
Ammonia-N (mg/kg)	--	2.38	1.43	1.48	13.1	1.32
Grain Size	--	See laboratory report for grain size distributions				
Total Organic Carbon %	--	0.246	U<0.150	U<0.150	0.242	U<0.150
Total Sulfides (mg/kg)	--	U<26.3	U<23.9	U<24.4	293	U<24.6
Total Solids (%)	--	75.53	84.23	81.10	76.05	79.60
Total Volatile Solids	--					
Metals (mg/kg dry weight)						
Antimony	150	U<2	U<2	U<2	U<2	U<2
Arsenic	57	3.12	2.31	2.72	3.63	2.25
Cadmium	5.1	U<0.2	U<0.2	0.217	0.355	U<0.2
Chromium	260	25.0	15.0	16.3	9.79	15.1
Copper	390	27.1	20.4	21.9	22.0	21.2
Lead	450	6.19	2.59	2.91	3.25	2.61
Nickel	--	32.9	16.8	19.2	14.2	17.7
Silver	6.1	U<1	U<1	U<1	U<1	U<1
Zinc	410	43.6	30.8	34.7	35.3	32.7
Mercury	0.41	U<0.025	U<0.025	U<0.025	U<0.025	U<0.025
PAHs (mg/kg dry weight)						
Naphthalene	2.1	U<0.01	U<0.01	U<0.01	4.7	U<0.01
Acenaphthylene	0.56	U<0.002	U<0.002	U<0.002	0.0093	U<0.002
Acenaphthene	0.5	0.0035	U<0.002	U<0.002	0.25	U<0.002
Fluorene	0.54	0.0035	U<0.002	U<0.002	0.20	U<0.002
Phenanthrene	1.5	0.013	U<0.002	U<0.002	0.53	U<0.002
Anthracene	0.96	0.0056	U<0.002	U<0.002	0.20	U<0.002
2-Methylnaphthalene	0.67	0.0024	U<0.002	U<0.002	0.36	U<0.002
Total LPAH	5.2	0.028	0	0	6.2	0
Fluoranthene	1.7	0.027	U<0.002	U<0.002	0.52	U<0.002
Pyrene	2.6	0.056	U<0.002	U<0.002	0.60	U<0.002
Benz(a)anthracene	1.3	0.013	U<0.002	U<0.002	0.19	U<0.002
Chrysene	1.4	0.039	U<0.002	U<0.002	0.31	U<0.002
Benzo(b)fluoranthene	3.2	0.030	U<0.002	U<0.002	0.20	U<0.002
Benzo(k)fluoranthene		0.011	U<0.002	U<0.002	0.080	U<0.002
Benzo(a)pyrene	1.6	0.017	U<0.002	U<0.002	0.14	U<0.002
Indeno(1,2,3-c,d)pyrene	0.6	0.0080	U<0.002	U<0.002	0.050	U<0.002
Dibenz(a,h)anthracene	0.23	0.0025	U<0.002	U<0.002	0.013	U<0.002
Benzo(g,h,i)perylene	0.67	0.0074	U<0.002	U<0.002	0.040	U<0.002
Total HPAH	12	0.21	0	0	2.1	0
Chlorinated Hydrocarbons (mg/kg dry weight)						
1,4-Dichlorobenzene	0.11	U<0.01	U<0.01	U<0.01	U<0.01	U<0.01
1,2-Dichlorobenzene	0.035	U<0.01	U<0.01	U<0.01	U<0.01	U<0.01
1,2,4-Trichlorobenzene	0.031	U<0.01	U<0.01	U<0.01	U<0.01	U<0.01
Hexachlorobenzene	0.022	U<0.01	U<0.01	U<0.01	U<0.01	U<0.01

Table 3-1 – East Pier Sediment Sampling Results (continued)

Boring	DMMP Screening Level	PG-1			PG-2	
Sample Name		PG1-0	PG1-6	PG1-11.5	PG2-0	PG2-10
Sample Depth		0'	6'	11.5'	0'	10'
Sampling Date		4/24/23	4/24/23	4/24/23	4/25/23	4/25/23
Phthalates (mg/kg dry weight)						
Dimethyl phthalate	0.071	U<0.071j	U<0.071j	U<0.071j	U<0.071j	U<0.071j
Diethyl phthalate	0.2	U<0.1	U<0.1	U<0.1	U<0.1	U<0.1
Di-n-butyl phthalate	1.4	U<0.1	U<0.1	U<0.1	U<0.1	U<0.1ca
Butyl benzyl phthalate	0.63	U<0.063j	U<0.063j	U<0.063j	U<0.063j ca	U<0.063j
Bis(2-ethylhexyl) phthalate	1.3	U<0.16	U<0.16	U<0.16	0.39	1.2j
Di-n-octyl phthalate	6.2	U<0.1	U<0.1	U<0.1	U<0.1	U<0.1
Phenols (mg/kg dry weight)						
Phenol	0.42	U<0.1	U<0.1	U<0.1	U<0.1	U<0.1
2-Methylphenol	0.063	U<0.063j	U<0.063j	U<0.063j	U<0.063j	U<0.063j
3-Methylphenol + 4-Methylphenol	0.67*	U<0.2	U<0.2	U<0.2	U<0.2	U<0.2
2,4-Dimethylphenol	0.029	U<0.029j	U<0.029j	U<0.029j	0.057j	U<0.029j
Pentachlorophenol	0.4	U<0.05	U<0.05	U<0.05	U<0.05	U<0.05
Misc. Extractables (mg/kg dry weight)						
Benzyl alcohol	0.057	U<0.057j	U<0.057j	U<0.057j	U<0.057j	U<0.057j
Benzoic acid	0.65	U<0.5	U<0.5	U<0.5	U<0.5	U<0.5
Dibenzofuran	0.54	U<0.01	U<0.01	U<0.01	0.79	U<0.01
Hexachlorobutadiene	0.011	U<0.01	U<0.01	U<0.01	U<0.01	U<0.01
N-Nitrosodiphenylamine	0.028	U<0.01	U<0.01	U<0.01	U<0.01	U<0.01
Pesticides & PCBs (mg/kg dry weight)						
4,4-DDD	0.016	U<0.001	U<0.001	U<0.001	U<0.001k	U<0.001
4,4-DDE	0.009	U<0.001	U<0.001	U<0.001	U<0.001	U<0.001
4,4-DDT	0.012	U<0.001	U<0.001	U<0.001	U<0.001ca	U<0.001
Aldrin	0.0095	U<0.0017	U<0.0017	U<0.0017	U<0.0017	U<0.0017
Total Chlordane	0.0028	U<0.0022	U<0.0022	U<0.0022	U<0.0022	U<0.0022
Dieldrin	0.0019	U<0.001	U<0.001	U<0.001	U<0.001	U<0.001
Heptachlor	0.0015	U<0.00050	U<0.00050	U<0.00050	U<0.00050	U<0.00050
Total PCBs (Aroclors)	0.13	U<0.004	U<0.004	U<0.004	U<0.004	U<0.004
Tributyltin (µg/kg dry weight)	73	U<3.85	U<3.84	U<3.86	7.43	U<3.86

ca - The calibration results for the analyte were outside of acceptance criteria, biased low; or the calibration results for the analyte were outside of acceptance criteria, biased high, with a detection for the analyte in the sample. The value reported is an estimate.

j - The analyte concentration is reported below the standard reporting limit. The value reported is an estimate.

k – The calibration results for the analyte were outside of acceptance criteria, biased high, and the analyte was not detected in the sample.

* - Screening level is only for 4-Methylphenol but laboratory analyses combined the two analytes.

Site Photos of East Pier Sediment Sampling



Drill rig operating over location PG-1.



Soil collected from PG-1 from 0' to 1.5' below the mudline.



Soil collected from PG-1 from 6' to 7.5' below the mudline.



Soil collected from PG-1 from 11.5' to 13' below the mudline.



Soil collected from PG-1 from 20' to 21.5' below the mudline.



Soil collected from PG-2 from 0' to 1.5' below the mudline.



Soil collected from PG-2 from 10' to 11.5' below the mudline.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Vineta Mills, M.S.
Eric Young, B.S.

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www.friedmanandbruya.com

June 6, 2023

Ben Carlson, Project Manager
Stratum Group
2102 Young St
Bellingham, WA 98225

Dear Mr Carlson:

Included are the results from the testing of material submitted on April 26, 2023 from the Stabbert Maritime, F&BI 304363 project. There are 36 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl
Project Manager

Enclosures
STG0606R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on April 26, 2023 by Friedman & Bruya, Inc. from the Stratum Group Stabbert Maritime, F&BI 304363 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>Stratum Group</u>
304363 -01	PG1-0
304363 -02	PG1-6
304363 -03	PG1-11.5
304363 -04	PG1-20
304363 -05	PG2-0
304363 -06	PG2-10

Samples PG1-0, PG1-6, PG1-11.5, PG2-0, and PG2-10 were sent to Fremont Analytical for total organic carbon and grain size analyses. In addition, the samples were sent to ARI for tributyltins, ammonia, and total sulfides analyses. The reports are enclosed.

The 8081B matrix spike and matrix spike duplicate failed the relative percent difference for endrin ketone. The analyte was not detected, therefore the data were acceptable.

The 8081B calibration standard exceeded the acceptance criteria for 4,4'DDD for PG2-0. The compound was not detected, therefore this did not represent an out of control condition.

The 8081B calibration standard failed the acceptance criteria for 4,4'-DDT and methoxychlor for sample PG2-0. The data were flagged accordingly.

The 6020B matrix spike and matrix spike duplicate failed the relative percent difference for copper. The laboratory control sample passed the acceptance criteria, therefore the results were due to sample inhomogeneity.

Mercury in the 1631E matrix spike and the associated relative percent difference exceeded the acceptance criteria. The laboratory control sample passed the acceptance criteria, therefore the results were due to matrix effect.

All other quality control requirements were acceptable.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	PG1-0	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	04/27/23	Lab ID:	304363-01
Date Analyzed:	04/27/23	Data File:	304363-01.109
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
----------	------------------------------

Antimony	<2
Arsenic	3.12
Cadmium	<0.2
Chromium	25.0
Copper	27.1
Lead	6.19
Nickel	32.9
Silver	<1
Zinc	43.6

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	PG1-6	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	04/27/23	Lab ID:	304363-02
Date Analyzed:	04/27/23	Data File:	304363-02.115
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
----------	------------------------------

Antimony	<2
Arsenic	2.31
Cadmium	<0.2
Chromium	15.0
Copper	20.4
Lead	2.59
Nickel	16.8
Silver	<1
Zinc	30.8

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	PG1-11.5	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	04/27/23	Lab ID:	304363-03
Date Analyzed:	04/27/23	Data File:	304363-03.116
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
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Antimony	<2
Arsenic	2.72
Cadmium	0.217
Chromium	16.3
Copper	21.9
Lead	2.91
Nickel	19.2
Silver	<1
Zinc	34.7

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	PG2-0	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	04/27/23	Lab ID:	304363-05
Date Analyzed:	04/27/23	Data File:	304363-05.117
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
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Antimony	<2
Arsenic	3.63
Cadmium	0.355
Chromium	9.79
Copper	22.0
Lead	3.25
Nickel	14.2
Silver	<1
Zinc	35.3

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	PG2-10	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	04/27/23	Lab ID:	304363-06
Date Analyzed:	04/27/23	Data File:	304363-06.118
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
----------	------------------------------

Antimony	<2
Arsenic	2.25
Cadmium	<0.2
Chromium	15.1
Copper	21.2
Lead	2.61
Nickel	17.7
Silver	<1
Zinc	32.7

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Stratum Group
Date Received:	Not Applicable	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	04/27/23	Lab ID:	I3-325 mb2
Date Analyzed:	04/27/23	Data File:	I3-325 mb2.038
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
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Antimony	<2
Arsenic	<1
Cadmium	<0.2
Chromium	<1
Copper	<5
Lead	<1
Nickel	<1
Silver	<1
Zinc	<1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 06/06/23

Date Received: 04/26/23

Project: Stabbert Maritime, F&BI 304363

Date Extracted: 04/27/23

Date Analyzed: 04/28/23

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES
FOR TOTAL MERCURY
USING EPA METHOD 1631E**

Results Reported on a Dry Weight Basis

Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Total Mercury</u>
PG1-0 304363-01	<0.025
PG1-6 304363-02	<0.025
PG1-11.5 304363-03	<0.025
PG2-0 304363-05	<0.025
PG2-10 304363-06	<0.025
Method Blank I3-325 MB2	<0.025

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	PG1-0	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	04/27/23	Lab ID:	304363-01
Date Analyzed:	04/27/23	Data File:	042720.D
Matrix:	Soil	Instrument:	GCMS12
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	54	14	115
Phenol-d6	65	29	121
Nitrobenzene-d5	77 ca	16	137
2-Fluorobiphenyl	78	46	122
2,4,6-Tribromophenol	73	17	154
Terphenyl-d14	85	31	167

Compounds:	Concentration mg/kg (ppm)	Compounds:	Concentration mg/kg (ppm)
Phenol	<0.1	N-Nitrosodiphenylamine	<0.01
1,4-Dichlorobenzene	<0.01	Hexachlorobenzene	<0.01
1,2-Dichlorobenzene	<0.01	Pentachlorophenol	<0.05
Benzyl alcohol	<0.057 j	Phenanthrene	0.013
2-Methylphenol	<0.063 j	Anthracene	0.0056
Hexachloroethane	<0.01	Di-n-butyl phthalate	<0.1
3-Methylphenol + 4-Methylphenol	<0.2	Fluoranthene	0.027
2,4-Dimethylphenol	<0.029 j	Pyrene	0.056
Benzoic acid	<0.5	Benzyl butyl phthalate	<0.063 j
1,2,4-Trichlorobenzene	<0.01	Benz(a)anthracene	0.013
Naphthalene	<0.01	Chrysene	0.039
Hexachlorobutadiene	<0.01	Bis(2-ethylhexyl) phthalate	<0.16
2-Methylnaphthalene	0.0024	Di-n-octyl phthalate	<0.1
Dimethyl phthalate	<0.071 j	Benzo(a)pyrene	0.017
Acenaphthylene	<0.002	Benzo(b)fluoranthene	0.030
Acenaphthene	0.0035	Benzo(k)fluoranthene	0.011
Dibenzofuran	<0.01	Indeno(1,2,3-cd)pyrene	0.0080
Diethyl phthalate	<0.1	Dibenz(a,h)anthracene	0.0025
Fluorene	0.0035	Benzo(g,h,i)perylene	0.0074

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	PG1-6	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	04/27/23	Lab ID:	304363-02
Date Analyzed:	04/27/23	Data File:	042721.D
Matrix:	Soil	Instrument:	GCMS12
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	55	14	115
Phenol-d6	68	29	121
Nitrobenzene-d5	77 ca	16	137
2-Fluorobiphenyl	77	46	122
2,4,6-Tribromophenol	82	17	154
Terphenyl-d14	89	31	167

Compounds:	Concentration mg/kg (ppm)	Compounds:	Concentration mg/kg (ppm)
Phenol	<0.1	N-Nitrosodiphenylamine	<0.01
1,4-Dichlorobenzene	<0.01	Hexachlorobenzene	<0.01
1,2-Dichlorobenzene	<0.01	Pentachlorophenol	<0.05
Benzyl alcohol	<0.057 j	Phenanthrene	<0.002
2-Methylphenol	<0.063 j	Anthracene	<0.002
Hexachloroethane	<0.01	Di-n-butyl phthalate	<0.1
3-Methylphenol + 4-Methylphenol	<0.2	Fluoranthene	<0.002
2,4-Dimethylphenol	<0.029 j	Pyrene	<0.002
Benzoic acid	<0.5	Benzyl butyl phthalate	<0.063 j
1,2,4-Trichlorobenzene	<0.01	Benz(a)anthracene	<0.002
Naphthalene	<0.01	Chrysene	<0.002
Hexachlorobutadiene	<0.01	Bis(2-ethylhexyl) phthalate	<0.16
2-Methylnaphthalene	<0.002	Di-n-octyl phthalate	<0.1
Dimethyl phthalate	<0.071 j	Benzo(a)pyrene	<0.002
Acenaphthylene	<0.002	Benzo(b)fluoranthene	<0.002
Acenaphthene	<0.002	Benzo(k)fluoranthene	<0.002
Dibenzofuran	<0.01	Indeno(1,2,3-cd)pyrene	<0.002
Diethyl phthalate	<0.1	Dibenz(a,h)anthracene	<0.002
Fluorene	<0.002	Benzo(g,h,i)perylene	<0.002

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	PG1-11.5	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	04/27/23	Lab ID:	304363-03
Date Analyzed:	04/28/23	Data File:	042722.D
Matrix:	Soil	Instrument:	GCMS12
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	54	14	115
Phenol-d6	63	29	121
Nitrobenzene-d5	76 ca	16	137
2-Fluorobiphenyl	77	46	122
2,4,6-Tribromophenol	84	17	154
Terphenyl-d14	92	31	167

Compounds:	Concentration mg/kg (ppm)	Compounds:	Concentration mg/kg (ppm)
Phenol	<0.1	N-Nitrosodiphenylamine	<0.01
1,4-Dichlorobenzene	<0.01	Hexachlorobenzene	<0.01
1,2-Dichlorobenzene	<0.01	Pentachlorophenol	<0.05
Benzyl alcohol	<0.057 j	Phenanthrene	<0.002
2-Methylphenol	<0.063 j	Anthracene	<0.002
Hexachloroethane	<0.01	Di-n-butyl phthalate	<0.1
3-Methylphenol + 4-Methylphenol	<0.2	Fluoranthene	<0.002
2,4-Dimethylphenol	<0.029 j	Pyrene	<0.002
Benzoic acid	<0.5	Benzyl butyl phthalate	<0.063 j
1,2,4-Trichlorobenzene	<0.01	Benz(a)anthracene	<0.002
Naphthalene	<0.01	Chrysene	<0.002
Hexachlorobutadiene	<0.01	Bis(2-ethylhexyl) phthalate	<0.16
2-Methylnaphthalene	<0.002	Di-n-octyl phthalate	<0.1
Dimethyl phthalate	<0.071 j	Benzo(a)pyrene	<0.002
Acenaphthylene	<0.002	Benzo(b)fluoranthene	<0.002
Acenaphthene	<0.002	Benzo(k)fluoranthene	<0.002
Dibenzofuran	<0.01	Indeno(1,2,3-cd)pyrene	<0.002
Diethyl phthalate	<0.1	Dibenz(a,h)anthracene	<0.002
Fluorene	<0.002	Benzo(g,h,i)perylene	<0.002

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	PG2-0	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	04/27/23	Lab ID:	304363-05
Date Analyzed:	04/27/23	Data File:	042719.D
Matrix:	Soil	Instrument:	GCMS9
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	46	22	119
Phenol-d6	56	38	124
Nitrobenzene-d5	47	10	198
2-Fluorobiphenyl	66	45	117
2,4,6-Tribromophenol	79	11	158
Terphenyl-d14	92	50	124

Compounds:	Concentration mg/kg (ppm)	Compounds:	Concentration mg/kg (ppm)
Phenol	<0.1	N-Nitrosodiphenylamine	<0.01
1,4-Dichlorobenzene	<0.01	Hexachlorobenzene	<0.01
1,2-Dichlorobenzene	<0.01	Pentachlorophenol	<0.05
Benzyl alcohol	<0.057 j	Phenanthrene	0.53
2-Methylphenol	<0.063 j	Anthracene	0.20
Hexachloroethane	<0.01	Di-n-butyl phthalate	<0.1
3-Methylphenol + 4-Methylphenol	<0.2	Fluoranthene	0.52
2,4-Dimethylphenol	0.057 j	Pyrene	0.60
Benzoic acid	<0.5	Benzyl butyl phthalate	<0.063 j ca
1,2,4-Trichlorobenzene	<0.01	Benz(a)anthracene	0.19
Naphthalene	4.7 ve	Chrysene	0.31
Hexachlorobutadiene	<0.01	Bis(2-ethylhexyl) phthalate	0.39
2-Methylnaphthalene	0.36	Di-n-octyl phthalate	<0.1
Dimethyl phthalate	<0.071 j	Benzo(a)pyrene	0.14
Acenaphthylene	0.0093	Benzo(b)fluoranthene	0.20
Acenaphthene	0.25	Benzo(k)fluoranthene	0.080
Dibenzofuran	0.079	Indeno(1,2,3-cd)pyrene	0.050
Diethyl phthalate	<0.1	Dibenz(a,h)anthracene	0.013
Fluorene	0.20	Benzo(g,h,i)perylene	0.040

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	PG2-0	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	04/27/23	Lab ID:	304363-05 1/10
Date Analyzed:	04/28/23	Data File:	042819.D
Matrix:	Soil	Instrument:	GCMS9
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	42 d	22	119
Phenol-d6	52 d	38	124
Nitrobenzene-d5	39 d	10	198
2-Fluorobiphenyl	60 d	45	117
2,4,6-Tribromophenol	85 d	11	158
Terphenyl-d14	76 d	50	124

Compounds:	Concentration mg/kg (ppm)
Naphthalene	4.7

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	PG2-10	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	04/27/23	Lab ID:	304363-06
Date Analyzed:	04/27/23	Data File:	042718.D
Matrix:	Soil	Instrument:	GCMS9
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	51	22	119
Phenol-d6	61	38	124
Nitrobenzene-d5	53	10	198
2-Fluorobiphenyl	59	45	117
2,4,6-Tribromophenol	68	11	158
Terphenyl-d14	79	50	124

Compounds:	Concentration mg/kg (ppm)	Compounds:	Concentration mg/kg (ppm)
Phenol	<0.1	N-Nitrosodiphenylamine	<0.01
1,4-Dichlorobenzene	<0.01	Hexachlorobenzene	<0.01
1,2-Dichlorobenzene	<0.01	Pentachlorophenol	<0.05
Benzyl alcohol	<0.057 j	Phenanthrene	<0.002
2-Methylphenol	<0.063 j	Anthracene	<0.002
Hexachloroethane	<0.01	Di-n-butyl phthalate	<0.1 ca
3-Methylphenol + 4-Methylphenol	<0.2	Fluoranthene	<0.002
2,4-Dimethylphenol	<0.029 j	Pyrene	<0.002
Benzoic acid	<0.5	Benzyl butyl phthalate	<0.063 j
1,2,4-Trichlorobenzene	<0.01	Benz(a)anthracene	<0.002
Naphthalene	<0.01	Chrysene	<0.002
Hexachlorobutadiene	<0.01	Bis(2-ethylhexyl) phthalate	1.5 ve
2-Methylnaphthalene	<0.002	Di-n-octyl phthalate	<0.1
Dimethyl phthalate	<0.071 j	Benzo(a)pyrene	<0.002
Acenaphthylene	<0.002	Benzo(b)fluoranthene	<0.002
Acenaphthene	<0.002	Benzo(k)fluoranthene	<0.002
Dibenzofuran	<0.01	Indeno(1,2,3-cd)pyrene	<0.002
Diethyl phthalate	<0.1	Dibenz(a,h)anthracene	<0.002
Fluorene	<0.002	Benzo(g,h,i)perylene	<0.002

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	PG2-10	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	04/27/23	Lab ID:	304363-06 1/10
Date Analyzed:	04/29/23	Data File:	042820.D
Matrix:	Soil	Instrument:	GCMS9
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	47 d	22	119
Phenol-d6	59 d	38	124
Nitrobenzene-d5	46 d	10	198
2-Fluorobiphenyl	56 d	45	117
2,4,6-Tribromophenol	63 d	11	158
Terphenyl-d14	66 d	50	124

Compounds:	Concentration mg/kg (ppm)
Bis(2-ethylhexyl) phthalate	1.2 j

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank	Client:	Stratum Group
Date Received:	Not Applicable	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	04/27/23	Lab ID:	03-1038 mb3
Date Analyzed:	04/27/23	Data File:	042718.D
Matrix:	Soil	Instrument:	GCMS12
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	63	14	115
Phenol-d6	74	29	121
Nitrobenzene-d5	88 ca	16	137
2-Fluorobiphenyl	82	46	122
2,4,6-Tribromophenol	76	17	154
Terphenyl-d14	94	31	167

Compounds:	Concentration mg/kg (ppm)	Compounds:	Concentration mg/kg (ppm)
Phenol	<0.1	N-Nitrosodiphenylamine	<0.01
1,4-Dichlorobenzene	<0.01	Hexachlorobenzene	<0.01
1,2-Dichlorobenzene	<0.01	Pentachlorophenol	<0.05
Benzyl alcohol	<0.057 j	Phenanthrene	<0.002
2-Methylphenol	<0.063 j	Anthracene	<0.002
Hexachloroethane	<0.01	Di-n-butyl phthalate	<0.1
3-Methylphenol + 4-Methylphenol	<0.2	Fluoranthene	<0.002
2,4-Dimethylphenol	<0.029 j	Pyrene	<0.002
Benzoic acid	<0.5	Benzyl butyl phthalate	<0.063 j
1,2,4-Trichlorobenzene	<0.01	Benz(a)anthracene	<0.002
Naphthalene	<0.01	Chrysene	<0.002
Hexachlorobutadiene	<0.01	Bis(2-ethylhexyl) phthalate	<0.16
2-Methylnaphthalene	<0.002	Di-n-octyl phthalate	<0.1
Dimethyl phthalate	<0.071 j	Benzo(a)pyrene	<0.002
Acenaphthylene	<0.002	Benzo(b)fluoranthene	<0.002
Acenaphthene	<0.002	Benzo(k)fluoranthene	<0.002
Dibenzofuran	<0.01	Indeno(1,2,3-cd)pyrene	<0.002
Diethyl phthalate	<0.1	Dibenz(a,h)anthracene	<0.002
Fluorene	<0.002	Benzo(g,h,i)perylene	<0.002

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	PG1-0	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	05/01/23	Lab ID:	304363-01 1/5
Date Analyzed:	05/01/23	Data File:	050111.D
Matrix:	Soil	Instrument:	GC9
Units:	mg/kg (ppm) Dry Weight	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	68	11	184
Decachlorobiphenyl	68	25	127

Compounds:	Concentration mg/kg (ppm)
Aroclor 1221	<0.004
Aroclor 1232	<0.004
Aroclor 1016	<0.004
Aroclor 1242	<0.004
Aroclor 1248	<0.004
Aroclor 1254	<0.004
Aroclor 1260	<0.004
Aroclor 1262	<0.004
Aroclor 1268	<0.004

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	PG1-6	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	05/01/23	Lab ID:	304363-02 1/5
Date Analyzed:	05/01/23	Data File:	050112.D
Matrix:	Soil	Instrument:	GC9
Units:	mg/kg (ppm) Dry Weight	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	108	11	184
Decachlorobiphenyl	101	25	127

Compounds:	Concentration mg/kg (ppm)
Aroclor 1221	<0.004
Aroclor 1232	<0.004
Aroclor 1016	<0.004
Aroclor 1242	<0.004
Aroclor 1248	<0.004
Aroclor 1254	<0.004
Aroclor 1260	<0.004
Aroclor 1262	<0.004
Aroclor 1268	<0.004

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	PG1-11.5	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	05/01/23	Lab ID:	304363-03 1/5
Date Analyzed:	05/01/23	Data File:	050113.D
Matrix:	Soil	Instrument:	GC9
Units:	mg/kg (ppm) Dry Weight	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	103	11	184
Decachlorobiphenyl	88	25	127

Compounds:	Concentration mg/kg (ppm)
Aroclor 1221	<0.004
Aroclor 1232	<0.004
Aroclor 1016	<0.004
Aroclor 1242	<0.004
Aroclor 1248	<0.004
Aroclor 1254	<0.004
Aroclor 1260	<0.004
Aroclor 1262	<0.004
Aroclor 1268	<0.004

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	PG2-0	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	05/01/23	Lab ID:	304363-05 1/5
Date Analyzed:	05/01/23	Data File:	050120.D
Matrix:	Soil	Instrument:	GC9
Units:	mg/kg (ppm) Dry Weight	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	92	11	184
Decachlorobiphenyl	94	25	127

Compounds:	Concentration mg/kg (ppm)
Aroclor 1221	<0.004
Aroclor 1232	<0.004
Aroclor 1016	<0.004
Aroclor 1242	<0.004
Aroclor 1248	<0.004
Aroclor 1254	<0.004
Aroclor 1260	<0.004
Aroclor 1262	<0.004
Aroclor 1268	<0.004

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	PG2-10	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	05/01/23	Lab ID:	304363-06 1/5
Date Analyzed:	05/01/23	Data File:	050114.D
Matrix:	Soil	Instrument:	GC9
Units:	mg/kg (ppm) Dry Weight	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	99	11	184
Decachlorobiphenyl	78	25	127

Compounds:	Concentration mg/kg (ppm)
Aroclor 1221	<0.004
Aroclor 1232	<0.004
Aroclor 1016	<0.004
Aroclor 1242	<0.004
Aroclor 1248	<0.004
Aroclor 1254	<0.004
Aroclor 1260	<0.004
Aroclor 1262	<0.004
Aroclor 1268	<0.004

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	Method Blank	Client:	Stratum Group
Date Received:	Not Applicable	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	05/01/23	Lab ID:	03-1052 mb 1/5
Date Analyzed:	05/01/23	Data File:	050107.D
Matrix:	Soil	Instrument:	GC9
Units:	mg/kg (ppm) Dry Weight	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	112	11	184
Decachlorobiphenyl	115	25	127

Compounds:	Concentration mg/kg (ppm)
Aroclor 1221	<0.004
Aroclor 1232	<0.004
Aroclor 1016	<0.004
Aroclor 1242	<0.004
Aroclor 1248	<0.004
Aroclor 1254	<0.004
Aroclor 1260	<0.004
Aroclor 1262	<0.004
Aroclor 1268	<0.004

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Organochlorine Pesticides By EPA Method 8081B

Client Sample ID:	PG1-0	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	05/01/23	Lab ID:	304363-01 1/5
Date Analyzed:	05/01/23	Data File:	050111.D
Matrix:	Soil	Instrument:	GC9
Units:	mg/kg (ppm) Dry Weight	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	68	11	137
Decachlorobiphenyl	78	50	150

Compounds:	Concentration mg/kg (ppm)
alpha-BHC	<0.00050
gamma-BHC (Lindane)	<0.00050
beta-BHC	<0.00050
delta-BHC	<0.00050
Heptachlor	<0.00050
Aldrin	<0.0017
Heptachlor Epoxide	<0.00050
trans-Chlordane	<0.0017
cis-Chlordane	<0.00050
4,4'-DDE	<0.001
Endosulfan I	<0.00050
Dieldrin	<0.001
Endrin	<0.001
4,4'-DDD	<0.001
Endosulfan II	<0.001
4,4'-DDT	<0.001
Methoxychlor	<0.005
Endosulfan Sulfate	<0.001
Endrin Ketone	<0.001
Toxaphene	<0.040

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Organochlorine Pesticides By EPA Method 8081B

Client Sample ID:	PG1-6	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	05/01/23	Lab ID:	304363-02 1/5
Date Analyzed:	05/01/23	Data File:	050112.D
Matrix:	Soil	Instrument:	GC9
Units:	mg/kg (ppm) Dry Weight	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	107	11	137
Decachlorobiphenyl	105	50	150

Compounds:	Concentration mg/kg (ppm)
alpha-BHC	<0.00050
gamma-BHC (Lindane)	<0.00050
beta-BHC	<0.00050
delta-BHC	<0.00050
Heptachlor	<0.00050
Aldrin	<0.0017
Heptachlor Epoxide	<0.00050
trans-Chlordane	<0.0017
cis-Chlordane	<0.00050
4,4'-DDE	<0.001
Endosulfan I	<0.00050
Dieldrin	<0.001
Endrin	<0.001
4,4'-DDD	<0.001
Endosulfan II	<0.001
4,4'-DDT	<0.001
Methoxychlor	<0.005
Endosulfan Sulfate	<0.001
Endrin Ketone	<0.001
Toxaphene	<0.040

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Organochlorine Pesticides By EPA Method 8081B

Client Sample ID: PG1-11.5	Client: Stratum Group
Date Received: 04/26/23	Project: Stabbert Maritime, F&BI 304363
Date Extracted: 05/01/23	Lab ID: 304363-03 1/5
Date Analyzed: 05/01/23	Data File: 050113.D
Matrix: Soil	Instrument: GC9
Units: mg/kg (ppm) Dry Weight	Operator: MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	96	11	137
Decachlorobiphenyl	98	50	150

Compounds:	Concentration mg/kg (ppm)
alpha-BHC	<0.00050
gamma-BHC (Lindane)	<0.00050
beta-BHC	<0.00050
delta-BHC	<0.00050
Heptachlor	<0.00050
Aldrin	<0.0017
Heptachlor Epoxide	<0.00050
trans-Chlordane	<0.0017
cis-Chlordane	<0.00050
4,4'-DDE	<0.001
Endosulfan I	<0.00050
Dieldrin	<0.001
Endrin	<0.001
4,4'-DDD	<0.001
Endosulfan II	<0.001
4,4'-DDT	<0.001
Methoxychlor	<0.005
Endosulfan Sulfate	<0.001
Endrin Ketone	<0.001
Toxaphene	<0.040

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Organochlorine Pesticides By EPA Method 8081B

Client Sample ID:	PG2-0	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	05/01/23	Lab ID:	304363-05 1/5
Date Analyzed:	05/04/23	Data File:	050406.D
Matrix:	Soil	Instrument:	GC9
Units:	mg/kg (ppm) Dry Weight	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	94	11	137
Decachlorobiphenyl	229 ip	50	150

Compounds:	Concentration mg/kg (ppm)
alpha-BHC	<0.00050
gamma-BHC (Lindane)	<0.00050
beta-BHC	<0.00050
delta-BHC	<0.00050
Heptachlor	<0.00050
Aldrin	<0.0017
Heptachlor Epoxide	<0.00050
trans-Chlordane	<0.0017
cis-Chlordane	<0.00050
4,4'-DDE	<0.001
Endosulfan I	<0.00050
Dieldrin	<0.001
Endrin	<0.001
4,4'-DDD	<0.001 k
Endosulfan II	<0.001
4,4'-DDT	<0.001 ca
Methoxychlor	<0.005 ca
Endosulfan Sulfate	<0.001
Endrin Ketone	<0.001

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Organochlorine Pesticides By EPA Method 8081B

Client Sample ID:	PG2-0	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	05/01/23	Lab ID:	304363-05 1/5
Date Analyzed:	05/01/23	Data File:	050120.D
Matrix:	Soil	Instrument:	GC9
Units:	mg/kg (ppm) Dry Weight	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	93	11	137
Decachlorobiphenyl	200 ip	50	150

Compounds:	Concentration mg/kg (ppm) Dry Weight
Toxaphene	<0.040

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Organochlorine Pesticides By EPA Method 8081B

Client Sample ID: PG2-10	Client: Stratum Group
Date Received: 04/26/23	Project: Stabbert Maritime, F&BI 304363
Date Extracted: 05/01/23	Lab ID: 304363-06 1/5
Date Analyzed: 05/01/23	Data File: 050114.D
Matrix: Soil	Instrument: GC9
Units: mg/kg (ppm) Dry Weight	Operator: MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	89	11	137
Decachlorobiphenyl	97	50	150

Compounds:	Concentration mg/kg (ppm)
alpha-BHC	<0.00050
gamma-BHC (Lindane)	<0.00050
beta-BHC	<0.00050
delta-BHC	<0.00050
Heptachlor	<0.00050
Aldrin	<0.0017
Heptachlor Epoxide	<0.00050
trans-Chlordane	<0.0017
cis-Chlordane	<0.00050
4,4'-DDE	<0.001
Endosulfan I	<0.00050
Dieldrin	<0.001
Endrin	<0.001
4,4'-DDD	<0.001
Endosulfan II	<0.001
4,4'-DDT	<0.001
Methoxychlor	<0.005
Endosulfan Sulfate	<0.001
Endrin Ketone	<0.001
Toxaphene	<0.040

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Organochlorine Pesticides By EPA Method 8081B

Client Sample ID:	Method Blank	Client:	Stratum Group
Date Received:	Not Applicable	Project:	Stabbert Maritime, F&BI 304363
Date Extracted:	05/01/23	Lab ID:	03-1052 mb 1/5
Date Analyzed:	05/01/23	Data File:	050107.D
Matrix:	Soil	Instrument:	GC9
Units:	mg/kg (ppm) Dry Weight	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	107	11	137
Decachlorobiphenyl	116	50	150

Compounds:	Concentration mg/kg (ppm)
alpha-BHC	<0.00050
gamma-BHC (Lindane)	<0.00050
beta-BHC	<0.00050
delta-BHC	<0.00050
Heptachlor	<0.00050
Aldrin	<0.0017
Heptachlor Epoxide	<0.00050
trans-Chlordane	<0.0017
cis-Chlordane	<0.00050
4,4'-DDE	<0.001
Endosulfan I	<0.00050
Dieldrin	<0.001
Endrin	<0.001
4,4'-DDD	<0.001
Endosulfan II	<0.001
4,4'-DDT	<0.001
Methoxychlor	<0.005
Endosulfan Sulfate	<0.001
Endrin Ketone	<0.001
Toxaphene	<0.040

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 06/06/23

Date Received: 04/26/23

Project: Stabbert Maritime, F&BI 304363

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 304360-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	mg/kg (ppm)	20	<1	95	107	75-125	12
Arsenic	mg/kg (ppm)	10	2.61	101 b	121 b	75-125	18 b
Cadmium	mg/kg (ppm)	10	<1	96	105	75-125	9
Chromium	mg/kg (ppm)	50	6.45	95	104	75-125	9
Copper	mg/kg (ppm)	50	9.51	91	114	75-125	22 vo
Lead	mg/kg (ppm)	50	7.24	98	102	75-125	4
Nickel	mg/kg (ppm)	25	5.66	92 b	100 b	75-125	8 b
Silver	mg/kg (ppm)	10	<1	93	104	75-125	11
Zinc	mg/kg (ppm)	50	93.5	190 b	119 b	75-125	46 b

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	mg/kg (ppm)	20	105	80-120
Arsenic	mg/kg (ppm)	10	103	80-120
Cadmium	mg/kg (ppm)	10	101	80-120
Chromium	mg/kg (ppm)	50	116	80-120
Copper	mg/kg (ppm)	50	108	80-120
Lead	mg/kg (ppm)	50	110	80-120
Nickel	mg/kg (ppm)	25	107	80-120
Silver	mg/kg (ppm)	10	101	80-120
Zinc	mg/kg (ppm)	50	105	80-120

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 06/06/23

Date Received: 04/26/23

Project: Stabbert Maritime, F&BI 304363

**QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL SAMPLES FOR
TOTAL MERCURY USING EPA METHOD 1631E**

Laboratory Code: 304363 x10 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Mercury	mg/kg (ppm)	5	<0.025	167 vo	122	71-125	31 vo

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Mercury	mg/kg (ppm)	5	111	68-143

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 06/06/23

Date Received: 04/26/23

Project: Stabbert Maritime, F&BI 304363

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: Laboratory Control Sample 1/5

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Phenol	mg/kg (ppm)	0.83	91	93	57-113	2
1,4-Dichlorobenzene	mg/kg (ppm)	0.83	86	89	54-102	3
1,2-Dichlorobenzene	mg/kg (ppm)	0.83	87	91	55-103	4
Benzyl alcohol	mg/kg (ppm)	4.2	91	97	36-147	6
2-Methylphenol	mg/kg (ppm)	0.83	94	96	62-107	2
Hexachloroethane	mg/kg (ppm)	0.83	86	85	54-105	1
3-Methylphenol + 4-Methylphenol	mg/kg (ppm)	0.83	91	98	63-110	7
2,4-Dimethylphenol	mg/kg (ppm)	0.83	90	90	31-105	0
Benzoic acid	mg/kg (ppm)	2.5	94	94	38-99	0
1,2,4-Trichlorobenzene	mg/kg (ppm)	0.83	90	91	59-105	1
Naphthalene	mg/kg (ppm)	0.83	86	90	59-105	5
Hexachlorobutadiene	mg/kg (ppm)	0.83	93	87	54-108	7
2-Methylnaphthalene	mg/kg (ppm)	0.83	84	92	62-108	9
Dimethyl phthalate	mg/kg (ppm)	0.83	92	97	63-124	5
Acenaphthylene	mg/kg (ppm)	0.83	91	97	61-111	6
Acenaphthene	mg/kg (ppm)	0.83	91	97	61-110	6
Dibenzofuran	mg/kg (ppm)	0.83	81	87	65-118	7
Diethyl phthalate	mg/kg (ppm)	0.83	85	92	63-124	8
Fluorene	mg/kg (ppm)	0.83	87	94	62-114	8
N-Nitrosodiphenylamine	mg/kg (ppm)	0.83	92	95	64-116	3
Hexachlorobenzene	mg/kg (ppm)	0.83	80	85	57-115	6
Pentachlorophenol	mg/kg (ppm)	0.83	98	98	56-130	0
Phenanthrene	mg/kg (ppm)	0.83	94	97	64-112	3
Anthracene	mg/kg (ppm)	0.83	92	95	63-111	3
Di-n-butyl phthalate	mg/kg (ppm)	0.83	93	102	52-130	9
Fluoranthene	mg/kg (ppm)	0.83	95	97	66-115	2
Pyrene	mg/kg (ppm)	0.83	96	101	65-112	5
Benzyl butyl phthalate	mg/kg (ppm)	0.83	88	93	56-131	6
Benz(a)anthracene	mg/kg (ppm)	0.83	93	97	64-116	4
Chrysene	mg/kg (ppm)	0.83	98	103	66-119	5
Bis(2-ethylhexyl) phthalate	mg/kg (ppm)	0.83	85	88	30-165	3
Di-n-octyl phthalate	mg/kg (ppm)	0.83	73	78	44-140	7
Benzo(a)pyrene	mg/kg (ppm)	0.83	86	91	62-116	6
Benzo(b)fluoranthene	mg/kg (ppm)	0.83	88	93	61-118	6
Benzo(k)fluoranthene	mg/kg (ppm)	0.83	87	95	65-119	9
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	0.83	86	84	64-130	2
Dibenz(a,h)anthracene	mg/kg (ppm)	0.83	90	87	67-131	3
Benzo(g,h,i)perylene	mg/kg (ppm)	0.83	90	86	67-126	5

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 06/06/23

Date Received: 04/26/23

Project: Stabbert Maritime, F&BI 304363

**QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL SAMPLES FOR
POLYCHLORINATED BIPHENYLS AS
AROCLOR 1016/1260 BY EPA METHOD 8082A**

Laboratory Code: 304363-06 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Control Limits	RPD (Limit 20)
Aroclor 1016	mg/kg (ppm)	0.25	<0.004	80	80	24-163	0
Aroclor 1260	mg/kg (ppm)	0.25	<0.004	80	83	10-194	4

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Aroclor 1016	mg/kg (ppm)	0.25	104	47-158
Aroclor 1260	mg/kg (ppm)	0.25	106	69-141

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 06/06/23

Date Received: 04/26/23

Project: Stabbert Maritime, F&BI 304363

**QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL SAMPLES FOR
ORGANOCHLORINE PESTICIDES
BY EPA METHOD 8081B**

Laboratory Code: 304363-06 1/5 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
alpha-BHC	mg/kg (ppm)	0.1	<0.01	76	79	17-122	4
gamma-BHC (Lindane)	mg/kg (ppm)	0.1	<0.01	65	68	18-128	5
beta-BHC	mg/kg (ppm)	0.1	<0.01	66	72	17-130	9
delta-BHC	mg/kg (ppm)	0.1	<0.01	57	63	20-124	10
Heptachlor	mg/kg (ppm)	0.1	<0.01	46	49	15-133	6
Aldrin	mg/kg (ppm)	0.1	<0.01	79	82	26-125	4
Heptachlor Epoxide	mg/kg (ppm)	0.1	<0.01	77	80	19-132	4
trans-Chlordane	mg/kg (ppm)	0.1	<0.01	75	78	15-157	4
cis-Chlordane	mg/kg (ppm)	0.1	<0.01	77	80	17-133	4
4,4'-DDE	mg/kg (ppm)	0.1	<0.01	80	83	17-139	4
Endosulfan I	mg/kg (ppm)	0.1	<0.01	77	80	19-130	4
Dieldrin	mg/kg (ppm)	0.1	<0.01	82	85	17-140	4
Endrin	mg/kg (ppm)	0.1	<0.01	73	76	20-143	4
4,4'-DDD	mg/kg (ppm)	0.1	<0.01	114	113	20-143	1
Endosulfan II	mg/kg (ppm)	0.1	<0.01	94	97	21-133	3
4,4'-DDT	mg/kg (ppm)	0.1	<0.01	5 vo	6 vo	10-385	18
Methoxychlor	mg/kg (ppm)	0.1	<0.01	3912 ip	12	10-226	199 ip
Endosulfan Sulfate	mg/kg (ppm)	0.1	<0.01	65	66	17-134	2
Endrin Ketone	mg/kg (ppm)	0.1	<0.01	51	40	10-153	24 vo
Toxaphene	mg/kg (ppm)	4	<0.1	42	39	12-123	7

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 06/06/23

Date Received: 04/26/23

Project: Stabbert Maritime, F&BI 304363

**QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL SAMPLES FOR
ORGANOCHLORINE PESTICIDES
BY EPA METHOD 8081B**

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
alpha-BHC	mg/kg (ppm)	0.1	97	57-116
gamma-BHC (Lindane)	mg/kg (ppm)	0.1	98	59-118
beta-BHC	mg/kg (ppm)	0.1	97	63-113
delta-BHC	mg/kg (ppm)	0.1	96	58-124
Heptachlor	mg/kg (ppm)	0.1	97	60-117
Aldrin	mg/kg (ppm)	0.1	100	63-113
Heptachlor Epoxide	mg/kg (ppm)	0.1	101	70-130
trans-Chlordane	mg/kg (ppm)	0.1	99	70-130
cis-Chlordane	mg/kg (ppm)	0.1	99	70-130
4,4'-DDE	mg/kg (ppm)	0.1	107	69-121
Endosulfan I	mg/kg (ppm)	0.1	100	70-130
Dieldrin	mg/kg (ppm)	0.1	104	70-130
Endrin	mg/kg (ppm)	0.1	103	65-140
4,4'-DDD	mg/kg (ppm)	0.1	103	70-130
Endosulfan II	mg/kg (ppm)	0.1	101	70-130
4,4'-DDT	mg/kg (ppm)	0.1	102	57-135
Methoxychlor	mg/kg (ppm)	0.1	104	57-147
Endosulfan Sulfate	mg/kg (ppm)	0.1	104	70-130
Endrin Ketone	mg/kg (ppm)	0.1	97	70-130
Toxaphene	mg/kg (ppm)	4	117	53-143

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria, biased low; or, the calibration results for the analyte were outside of acceptance criteria, biased high, with a detection for the analyte in the sample. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the standard reporting limit. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

k - The calibration results for the analyte were outside of acceptance criteria, biased high, and the analyte was not detected in the sample.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

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Page # 1 of 1

~~17~~ Standard turnaround

☐ RUSH _____

SAMPLE DISPOSAL

Default: Dispose after 30 days

[illegible]

Friedman & Bruya, Inc.
Ph. (206) 285-8282

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
	Ben Carlson	Station Group	4/23/23	1600
Received by:		FedEx		
Relinquished by:				
Received by:	Pham Pham	FedEx	4/24/23	1330



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RE: 304363
Work Order Number: 2304634

May 18, 2023

Attention Michael Erdahl:

Fremont Analytical, Inc. received 6 sample(s) on 4/27/2023 for the analyses presented in the following report.

Grain Size by ASTM D422

Total Organic Carbon by EPA 9060

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

*DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.3 for Environmental Testing
ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing
Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910*

Original

www.fremontanalytical.com



Date: 05/18/2023

CLIENT: Friedman & Bruya
Project: 304363
Work Order: 2304634

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2304634-001	PG1-0	04/24/2023 11:10 AM	04/27/2023 4:38 PM
2304634-002	PG1-6	04/24/2023 12:00 PM	04/27/2023 4:38 PM
2304634-003	PG1-11.5	04/24/2023 1:10 PM	04/27/2023 4:38 PM
2304634-004	PG1-20	04/24/2023 1:30 PM	04/27/2023 4:38 PM
2304634-005	PG2-0	04/24/2023 9:30 AM	04/27/2023 4:38 PM
2304634-006	PG2-10	04/24/2023 10:30 AM	04/27/2023 4:38 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

CLIENT: Friedman & Bruya
Project: 304363

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers:

- * - Flagged value is not within established control limits
- B - Analyte detected in the associated Method Blank
- D - Dilution was required
- E - Value above quantitation range
- H - Holding times for preparation or analysis exceeded
- I - Analyte with an internal standard that does not meet established acceptance criteria
- J - Analyte detected below Reporting Limit
- N - Tentatively Identified Compound (TIC)
- Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
- S - Spike recovery outside accepted recovery limits
- ND - Not detected at the Reporting Limit
- R - High relative percent difference observed

Acronyms:

- %Rec - Percent Recovery
- CCB - Continued Calibration Blank
- CCV - Continued Calibration Verification
- DF - Dilution Factor
- DUP - Sample Duplicate
- HEM - Hexane Extractable Material
- ICV - Initial Calibration Verification
- LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
- MCL - Maximum Contaminant Level
- MB or MBLANK - Method Blank
- MDL - Method Detection Limit
- MS/MSD - Matrix Spike / Matrix Spike Duplicate
- PDS - Post Digestion Spike
- Ref Val - Reference Value
- REP - Sample Replicate
- RL - Reporting Limit
- RPD - Relative Percent Difference
- SD - Serial Dilution
- SGT - Silica Gel Treatment
- SPK - Spike
- Surr - Surrogate



Work Order: 2304634
Date Reported: 5/18/2023

CLIENT: Friedman & Bruya
Project: 304363

Lab ID: 2304634-001
Client Sample ID: PG1-0

Collection Date: 4/24/2023 11:10:00 AM
Matrix: Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
----------	--------	----	------	-------	----	---------------

Total Organic Carbon by EPA 9060

Batch ID: 40345 Analyst: AT

Total Organic Carbon	0.246	0.150		%-dry	1	5/15/2023 1:06:00 PM
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Lab ID: 2304634-002
Client Sample ID: PG1-6

Collection Date: 4/24/2023 12:00:00 PM
Matrix: Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
----------	--------	----	------	-------	----	---------------

Total Organic Carbon by EPA 9060

Batch ID: 40345 Analyst: AT

Total Organic Carbon	ND	0.150		%-dry	1	5/15/2023 1:19:00 PM
----------------------	----	-------	--	-------	---	----------------------

Lab ID: 2304634-003
Client Sample ID: PG1-11.5

Collection Date: 4/24/2023 1:10:00 PM
Matrix: Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
----------	--------	----	------	-------	----	---------------

Total Organic Carbon by EPA 9060

Batch ID: 40345 Analyst: AT

Total Organic Carbon	ND	0.150		%-dry	1	5/15/2023 1:33:00 PM
----------------------	----	-------	--	-------	---	----------------------

Lab ID: 2304634-005
Client Sample ID: PG2-0

Collection Date: 4/24/2023 9:30:00 AM
Matrix: Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
----------	--------	----	------	-------	----	---------------

Total Organic Carbon by EPA 9060

Batch ID: 40345 Analyst: AT

Total Organic Carbon	0.242	0.150		%-dry	1	5/15/2023 1:48:00 PM
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Analytical Report

Work Order: 2304634
Date Reported: 5/18/2023

CLIENT: Friedman & Bruya
Project: 304363

Lab ID: 2304634-006

Collection Date: 4/24/2023 10:30:00 AM

Client Sample ID: PG2-10

Matrix: Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
----------	--------	----	------	-------	----	---------------

Total Organic Carbon by EPA 9060

Batch ID: 40345

Analyst: AT

Total Organic Carbon	ND	0.150		%-dry	1	5/15/2023 2:23:00 PM
----------------------	----	-------	--	-------	---	----------------------

Grain Size by ASTM D422

Project:	304363
Client:	Friedman & Bruya
Lab Project #:	2304634

Percent Finer (Passing) than the Indicated Size

UOM = Percent

Grain Size Classification	Gravel						Coarse Sand	Medium Sand		Fine Sand			Silt		
Sieve Size	3"	2"	1 1/2"	1"	3/4"	3/8"	#4	#10	#20	#40	#60	#140	#200	#325	#450
Particle Size (Microns)	76200	50800	38100	25400	19050	9525	4750	2000	850	425	250	106	75	45	34
Sample ID															
PG1-0	100%	100%	100%	100%	94.9%	88.4%	77.2%	46.4%	30.9%	18.1%	11.5%	5.03%	1.78%	0.209%	0.0462%
PG1-6	100%	100%	100%	100%	100%	100%	99.7%	93.5%	90.3%	78.6%	73.4%	55.2%	18.4%	3.99%	0.637%
PG1-11.5	100%	100%	100%	100%	100%	100%	99.9%	98.9%	95.8%	80.7%	75.2%	60.2%	20.5%	5.76%	0.976%
PG2-0	100%	100%	100%	100%	100%	99.5%	97.3%	83.6%	67.1%	57.7%	53.0%	26.6%	12.7%	5.05%	1.23%
PG2-10	100%	100%	100%	100%	100%	100%	99.8%	99.5%	97.6%	90.5%	86.5%	80.4%	56.4%	24.0%	6.80%

Grain Size by ASTM D422

Project:	304363
Client:	Friedman & Bruya
Lab Project #:	2304634

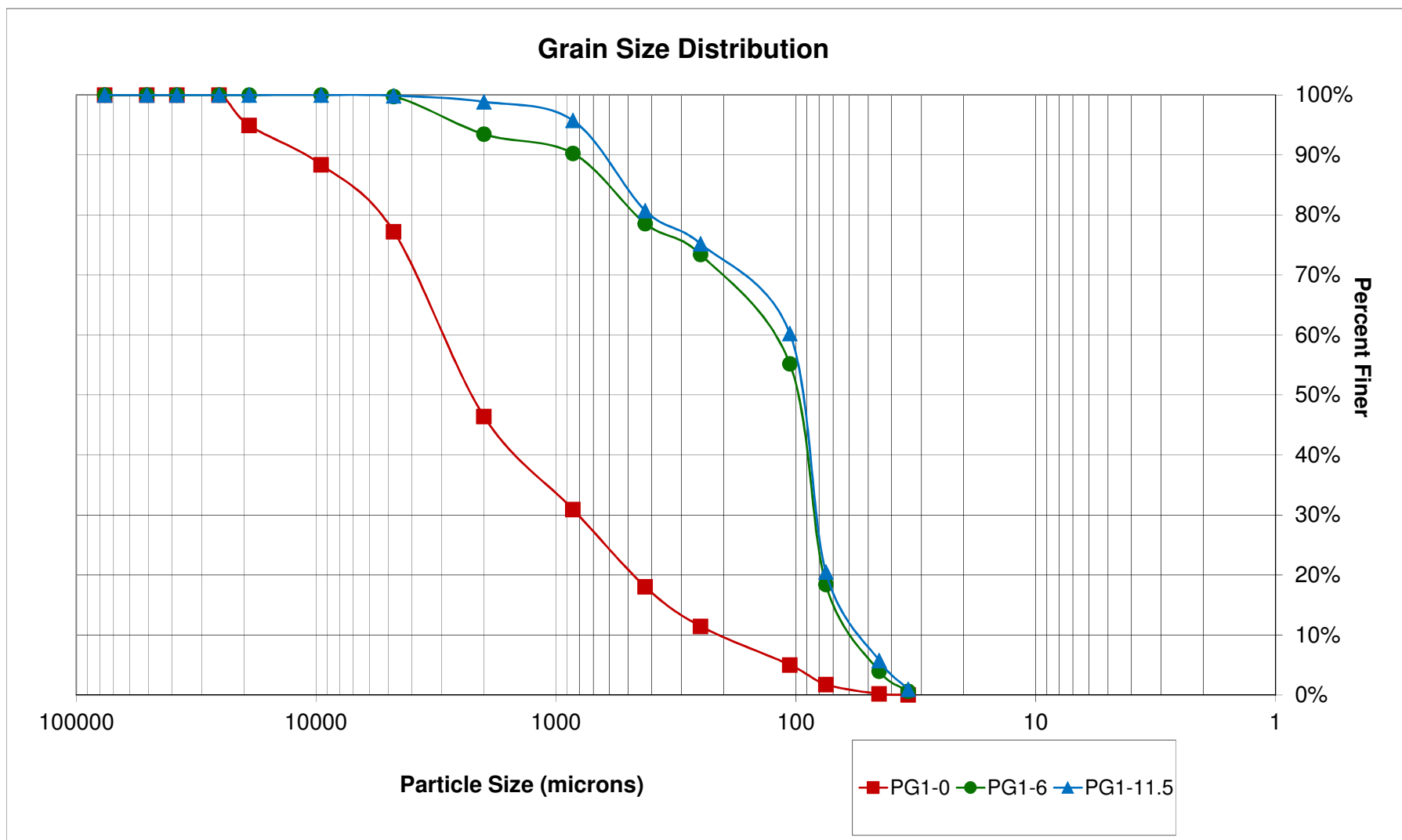
Percent Retained in Each Size Fraction

UOM = Percent

Grain Size Classification	Gravel							Coarse Sand	Medium Sand		Fine Sand			Silt		
Sieves Size	3"	2"	1 1/2"	1"	3/4"	3/8"	#4	#10	#20	#40	#60	#140	#200	#325	#450	
Particle Size (Microns)	>76200	76200-50800	50800-38100	38100-25400	25400-19000	19050-9525	9525-4750	4750-2000	2000-850	850-425	425-250	250-106	106-75	75-45	45-34	<34
Sample ID																
PG1-0	0.00%	0.00%	0.00%	0.00%	5.07%	6.55%	11.2%	30.8%	15.5%	12.9%	6.59%	6.44%	3.25%	1.57%	0.163%	0.0462%
PG1-6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.275%	6.27%	3.20%	11.7%	5.15%	18.2%	36.8%	14.4%	3.36%	0.637%
PG1-11.5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.115%	1.03%	3.11%	15.0%	5.53%	15.0%	39.7%	14.7%	4.78%	0.976%
PG2-0	0.00%	0.00%	0.00%	0.00%	0.00%	0.542%	2.19%	13.7%	16.5%	9.37%	4.71%	26.4%	13.9%	7.63%	3.82%	1.23%
PG2-10	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.189%	0.294%	1.93%	7.04%	4.04%	6.15%	23.9%	32.4%	17.2%	6.80%

Grain Size by ASTM D422

Project: 304363
Client: Friedman & Bruya
Lab Project #: 2304634



Work Order: 2304634
CLIENT: Friedman & Bruya
Project: 304363

QC SUMMARY REPORT

Total Organic Carbon by EPA 9060

Sample ID: MB-40345		SampType: MBLK			Units: %-dry		Prep Date: 5/15/2023			RunNo: 83993		
Client ID: MBLKS		Batch ID: 40345			Analysis Date: 5/15/2023					SeqNo: 1752000		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual	

Total Organic Carbon ND 0.150

Sample ID: LCS-40345		SampType: LCS			Units: %-dry		Prep Date: 5/15/2023			RunNo: 83993		
Client ID: LCSS		Batch ID: 40345			Analysis Date: 5/15/2023					SeqNo: 1752001		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual	

Total Organic Carbon 0.996 0.150 1.000 0 99.6 80 120

Sample ID: 2304634-006ADUP		SampType: DUP			Units: %-dry		Prep Date: 5/15/2023			RunNo: 83993		
Client ID: PG2-10		Batch ID: 40345			Analysis Date: 5/15/2023			SeqNo: 1752007				
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual	

Total Organic Carbon ND 0.150 0 20

Sample ID: 2304634-006AMS		SampType: MS			Units: %-dry		Prep Date: 5/15/2023			RunNo: 83993		
Client ID: PG2-10		Batch ID: 40345			Analysis Date: 5/15/2023					SeqNo: 1752008		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual	

Total Organic Carbon 1.16 0.150 1.000 0 116 75 125

Sample ID: 2304634-006AMSD		SampType: MSD			Units: %-dry		Prep Date: 5/15/2023			RunNo: 83993		
Client ID: PG2-10		Batch ID: 40345			Analysis Date: 5/15/2023			SeqNo: 1752009				
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual	

Total Organic Carbon 1.10 0.150 1.000 0 110 75 125 1.155 4.88 20

Client Name: FB

Work Order Number: 2304634

Logged by: Morgan Wilson

Date Received: 4/27/2023 4:38:00 PM

Chain of Custody

1. Is Chain of Custody complete? Yes ☒ No ☐ Not Present ☐
2. How was the sample delivered? Client

Log In

3. Coolers are present? Yes ☒ No ☐ NA ☐
4. Shipping container/cooler in good condition? Yes ☒ No ☐
5. Custody Seals present on shipping container/cooler?
(Refer to comments for Custody Seals not intact) Yes ☐ No ☐ Not Present ☒
6. Was an attempt made to cool the samples? Yes ☒ No ☐ NA ☐
7. Were all items received at a temperature of >2°C to 6°C * Yes ☒ No ☐ NA ☐
8. Sample(s) in proper container(s)? Yes ☒ No ☐
9. Sufficient sample volume for indicated test(s)? Yes ☒ No ☐
10. Are samples properly preserved? Yes ☒ No ☐
11. Was preservative added to bottles? Yes ☐ No ☒ NA ☐
12. Is there headspace in the VOA vials? Yes ☐ No ☐ NA ☒
13. Did all samples containers arrive in good condition(unbroken)? Yes ☒ No ☐
14. Does paperwork match bottle labels? Yes ☒ No ☐
15. Are matrices correctly identified on Chain of Custody? Yes ☒ No ☐
16. Is it clear what analyses were requested? Yes ☒ No ☐
17. Were all holding times able to be met? Yes ☒ No ☐

Special Handling (if applicable)

18. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☒

Person Notified:

Date:

By Whom:

Via:

☐ eMail

☐ Phone

☐ Fax

☐ In Person

Regarding:

Client Instructions:

19. Additional remarks:

Item Information

Item #	Temp °C
Sample	1.1

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Page # 1 of 1

SUBCONTRACTOR Fremont	
PROJECT NAME/NO. 304363	PO # D-272
REMARKS EIM EDD	

TURNAROUND TIME

☒ Standard TAT
RUSH **2304634**

Rush charges authorized by: _____

SAMPLE DISPOSAL

Dispose after 30 days

Return samples

Will call with instructions

ANALYSES REQUESTED

[illegible]

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
	Michael Erdahl	Friedman & Bruya	4/27/23	0800
Received by: 	Mr Ritz	FAL	4/27/23	16:38
Relinquished by:				
Received by:				



Analytical Resources, LLC
Analytical Chemists and Consultants
Tukwila, WA

31 May 2023

Michael Erdahl
Friedman & Bruya Inc.
3012 16th Avenue West
Seattle, WA 98119-2029

RE: 304363

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)
23D0653

Associated SDG ID(s)
N/A

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, LLC

Shelly Fishel, Project Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



SUBCONTRACT SAMPLE CHAIN OF CUSTODY

Send Report To Michael Erdahl

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 merdahl@friedmanandbrya.com

TURNAROUND TIME

☒ Standard TAT

RUSH _____

Rush charges authorized by: _____

SAMPLE DISPOSAL

Dispose after 30 days

Return samples

Will call with instructions

Friedman & Brya, Inc. 3012 16th Avenue West Seattle, WA 98119-2029 Pl. (206) 283-8282 Fax (206) 283-5044	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: 	Michael Erdahl	Friedman & Brya	4/17/15	0800	
Received by: 	Jacob Welch	AP, LLC	4/17/15	1200	
Relinquished by:					
Received by:					



Friedman & Bruya Inc.
3012 16th Avenue West
Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
PG1-0	23D0653-01	Solid	24-Apr-2023 11:10	27-Apr-2023 10:00
PG1-6	23D0653-02	Solid	24-Apr-2023 12:00	27-Apr-2023 10:00
PG1-11.5	23D0653-03	Solid	24-Apr-2023 13:10	27-Apr-2023 10:00
PG2-0	23D0653-05	Solid	24-Apr-2023 09:30	27-Apr-2023 10:00
PG2-10	23D0653-06	Solid	24-Apr-2023 10:30	27-Apr-2023 10:00



Friedman & Bruya Inc.
3012 16th Avenue West
Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

Work Order Case Narrative

Client: Friedman & Bruya Inc.

Project: 304363

Work Order: 23D0653

Sample receipt

Sample(s) as listed on the preceding page were received 27-Apr-2023 10:00 under ARI work order 23D0653. For details regarding sample receipt, please refer to the Cooler Receipt Form.

Butyl Tin(s) - EPA Method SW8270E-SIM

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

The matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and relative percent difference (RPD) were within advisory control limits except as flagged.

Wet Chemistry

The sample(s) were prepared and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

The matrix spike (MS) percent recoveries and the duplicate (DUP) relative percent difference (RPD) were within advisory control limits.



Analytical Resources, LLC
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Friedman & Buga

Project Name: 384363

COC No(s): NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: NA

Assigned ARI Job No: 2300653

Tracking No: NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of the cooler?

YES NO

Were custody papers included with the cooler?

YES NO

Were custody papers properly filled out (ink, signed, etc.)

YES NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)

Time 1000

3.7

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: 7009708

Cooler Accepted by: PLB

Date: 9/27/23

Time: 1000

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?

YES NO

What kind of packing material was used? ...

Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other:

Was sufficient ice used (if appropriate)?

NA YES NO

How were bottles sealed in plastic bags?

Individually Grouped Not

Did all bottles arrive in good condition (unbroken)?

YES NO

Were all bottle labels complete and legible?

YES NO

Did the number of containers listed on COC match with the number of containers received?

YES NO

Did all bottle labels and tags agree with custody papers?

YES NO

Were all bottles used correct for the requested analyses?

YES NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) ...

NA YES NO

Were all VOC vials free of air bubbles?

NA YES NO

Was sufficient amount of sample sent in each bottle?

YES NO

Date VOC Trip Blank was made at ARI.....

NA

Were the sample(s) split by ARI? NA

YES

Date/Time:

Equipment:

Split by:

Samples Logged by: PLB

Date: 9/27/23

Time: 15:14

Labels checked by: PLB

**** Notify Project Manager of discrepancies or concerns ****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: _____ Date: _____



Analytical Resources, Incorporated
Analytical Chemists and Consultants

Conventionals Laboratory Analyst Notes

ARI Job No.: 23D0653

Client ID: _____

Parameter: _____

Client Project: _____

List problems, concerns, corrective actions and any other pertinent information

sample - OI unpreserved container broke between
log in storing the sample & conventionals
picking sample from storage. sample transferred
to new container

Analyst Initials:

BF

Date:

4/27/23 1643



Friedman & Bruya Inc.
3012 16th Avenue West
Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG1-0
23D0653-01 (Solid)

Butyl Tins

Method: EPA 8270E-SIM

Sampled: 04/24/2023 11:10

Instrument: NT12 Analyst: JZ

Analyzed: 05/15/2023 17:49

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Extract ID: 23D0653-01 A 01
	Preparation Batch: BLE0004	Dry Weight: 5.01 g
	Sample Size: 6.41 g (wet)	% Solids: 78.12
	Prepared: 05/03/2023	Final Volume: 0.5 mL

Sample Cleanup:	Cleanup Method: Silica Gel	Extract ID: 23D0653-01 A 01
	Cleanup Batch: CLE0133	Initial Volume: 0.5 uL
	Cleaned: 12-May-2023	Final Volume: 0.5 uL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Tributyltin Ion	36643-28-4	1	0.449	3.85	ND	ug/kg	U
Dibutyltin Ion	14488-53-0	1	1.73	5.77	ND	ug/kg	U
Butyltin Ion	78763-54-9	1	1.89	4.07	ND	ug/kg	U
Tetrabutyltin	1461-25-2	1	4.99	4.99	ND	ug/kg	U
Surrogate: Triphenyltin				30-160 %	91.8	%	
Surrogate: Tripropyltin				30-160 %	87.0	%	



Friedman & Bruya Inc.
3012 16th Avenue West
Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG1-0
23D0653-01 (Solid)

Wet Chemistry

Method: EPA 9034

Sampled: 04/24/2023 11:10

Instrument: S2 Buret Analyst: CDE

Analyzed: 05/06/2023 19:01

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Sample Size: 5.31 g (wet)	Extract ID: 23D0653-01 B
	Preparation Batch: BLD0825	Final Volume: 100 mL	Dry Weight: 3.81 g
	Prepared: 04/29/2023		% Solids: 71.70

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfide	18496-25-8	1	26.3	26.3	ND	mg/kg	U



Friedman & Bruya Inc.
3012 16th Avenue West
Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG1-0
23D0653-01 (Solid)

Wet Chemistry

Method: PSEP 1986

Sampled: 04/24/2023 11:10

Instrument: BAL2 Analyst: UW

Analyzed: 04/27/2023 15:35

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 23D0653-01
	Preparation Batch: BLD0789	Final Volume: 5 g	Dry Weight: 3.78 g
	Prepared: 04/27/2023		% Solids: 75.53

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids, Sulfide		1	0.04	0.04	71.70	%	



Friedman & Bruya Inc.
3012 16th Avenue West
Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG1-0
23D0653-01 (Solid)

Wet Chemistry

Method: SM 2540 G-97

Sampled: 04/24/2023 11:10

Instrument: BAL2 Analyst: UW

Analyzed: 04/28/2023 15:27

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 23D0653-01
	Preparation Batch: BLD0819	Final Volume: 5 g	Dry Weight: 3.78 g
	Prepared: 04/28/2023		% Solids: 75.53

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	75.53	%	



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Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG1-0
23D0653-01 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-97

Sampled: 04/24/2023 11:10

Instrument: LACHAT1 Analyst: MAM

Analyzed: 04/28/2023 13:51

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: No Prep Wet Chem

Extract ID: 23D0653-01 A

Preparation Batch: BLD0798

Sample Size: 4.68 g (wet)

Dry Weight: 3.53 g

Prepared: 04/27/2023

Final Volume: 40 g

% Solids: 75.53

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.45	0.45	2.38	mg/kg NH3-N	



Friedman & Bruya Inc.
3012 16th Avenue West
Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG1-6
23D0653-02 (Solid)

Butyl Tins

Method: EPA 8270E-SIM

Sampled: 04/24/2023 12:00

Instrument: NT12 Analyst: JZ

Analyzed: 05/15/2023 18:06

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Sample Size: 6.24 g (wet)	Extract ID: 23D0653-02 A 01
	Preparation Batch: BLE0004	Final Volume: 0.5 mL	Dry Weight: 5.03 g
	Prepared: 05/03/2023		% Solids: 80.53
Sample Cleanup:	Cleanup Method: Silica Gel	Initial Volume: 0.5 uL	Extract ID: 23D0653-02 A 01
	Cleanup Batch: CLE0133	Final Volume: 0.5 uL	
	Cleaned: 12-May-2023		

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Tributyltin Ion	36643-28-4	1	0.448	3.84	ND	ug/kg	U
Dibutyltin Ion	14488-53-0	1	1.72	5.75	ND	ug/kg	U
Butyltin Ion	78763-54-9	1	1.88	4.06	ND	ug/kg	U
Tetrabutyltin	1461-25-2	1	4.98	4.98	ND	ug/kg	U
<i>Surrogate: Triphenyltin</i>					30-160 %	89.8 %	
<i>Surrogate: Tripropyltin</i>					30-160 %	89.5 %	



Friedman & Bruya Inc.
3012 16th Avenue West
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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG1-6
23D0653-02 (Solid)

Wet Chemistry

Method: EPA 9034

Sampled: 04/24/2023 12:00

Instrument: S2 Buret Analyst: CDE

Analyzed: 05/06/2023 19:01

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Sample Size: 5.255 g (wet)	Extract ID: 23D0653-02 B
	Preparation Batch: BLD0825	Final Volume: 100 mL	Dry Weight: 4.19 g
	Prepared: 04/29/2023		% Solids: 79.70

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfide	18496-25-8	1	23.9	23.9	ND	mg/kg	U



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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG1-6
23D0653-02 (Solid)

Wet Chemistry

Method: PSEP 1986

Sampled: 04/24/2023 12:00

Instrument: BAL2 Analyst: UW

Analyzed: 04/27/2023 15:35

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: No Prep Wet Chem

Extract ID: 23D0653-02

Preparation Batch: BLD0789

Sample Size: 5 g (wet)

Dry Weight: 4.21 g

Prepared: 04/27/2023

Final Volume: 5 g

% Solids: 84.23

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids, Sulfide		1	0.04	0.04	79.70	%	



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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG1-6
23D0653-02 (Solid)

Wet Chemistry

Method: SM 2540 G-97

Sampled: 04/24/2023 12:00

Instrument: BAL2 Analyst: UW

Analyzed: 04/28/2023 15:27

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 23D0653-02
	Preparation Batch: BLD0819	Final Volume: 5 g	Dry Weight: 4.21 g
	Prepared: 04/28/2023		% Solids: 84.23

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	84.23	%	



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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG1-6
23D0653-02 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-97
Instrument: LACHAT1 Analyst: MAM

Sampled: 04/24/2023 12:00
Analyzed: 04/28/2023 13:55

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 4.56 g (wet)	Extract ID: 23D0653-02 A
	Preparation Batch: BLD0798	Final Volume: 40 g	Dry Weight: 3.84 g
	Prepared: 04/27/2023		% Solids: 84.23

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.42	0.42	1.43	mg/kg NH3-N	



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Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG1-11.5
23D0653-03 (Solid)

Butyl Tins

Method: EPA 8270E-SIM

Sampled: 04/24/2023 13:10

Instrument: NT12 Analyst: JZ

Analyzed: 05/15/2023 18:23

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Sample Size: 6.25 g (wet)	Extract ID: 23D0653-03 A 01
	Preparation Batch: BLE0004	Final Volume: 0.5 mL	Dry Weight: 5.00 g
	Prepared: 05/03/2023		% Solids: 80.00
Sample Cleanup:	Cleanup Method: Silica Gel	Initial Volume: 0.5 uL	Extract ID: 23D0653-03 A 01
	Cleanup Batch: CLE0133	Final Volume: 0.5 uL	
	Cleaned: 12-May-2023		

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Tributyltin Ion	36643-28-4	1	0.450	3.86	ND	ug/kg	U
Dibutyltin Ion	14488-53-0	1	1.73	5.78	ND	ug/kg	U
Butyltin Ion	78763-54-9	1	1.89	4.08	ND	ug/kg	U
Tetrabutyltin	1461-25-2	1	5.00	5.00	ND	ug/kg	U
<i>Surrogate: Triphenyltin</i>					30-160 %	97.6 %	
<i>Surrogate: Tripropyltin</i>					30-160 %	96.0 %	



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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG1-11.5
23D0653-03 (Solid)

Wet Chemistry

Method: EPA 9034

Sampled: 04/24/2023 13:10

Instrument: S2 Buret Analyst: CDE

Analyzed: 05/06/2023 19:01

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Sample Size: 5.221 g (wet)	Extract ID: 23D0653-03 B
	Preparation Batch: BLD0825	Final Volume: 100 mL	Dry Weight: 4.09 g
	Prepared: 04/29/2023		% Solids: 78.40

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfide	18496-25-8	1	24.4	24.4	ND	mg/kg	U



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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG1-11.5
23D0653-03 (Solid)

Wet Chemistry

Method: PSEP 1986

Sampled: 04/24/2023 13:10

Instrument: BAL2 Analyst: UW

Analyzed: 04/27/2023 15:35

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 23D0653-03
	Preparation Batch: BLD0789	Final Volume: 5 g	Dry Weight: 4.06 g
	Prepared: 04/27/2023		% Solids: 81.10

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids, Sulfide		1	0.04	0.04	78.40	%	



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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG1-11.5
23D0653-03 (Solid)

Wet Chemistry

Method: SM 2540 G-97

Sampled: 04/24/2023 13:10

Instrument: BAL2 Analyst: UW

Analyzed: 04/28/2023 15:27

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 23D0653-03
	Preparation Batch: BLD0819	Final Volume: 5 g	Dry Weight: 4.06 g
	Prepared: 04/28/2023		% Solids: 81.10

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	81.10	%	



Friedman & Bruya Inc.
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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG1-11.5
23D0653-03 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-97
Instrument: LACHAT1 Analyst: MAM

Sampled: 04/24/2023 13:10
Analyzed: 04/28/2023 13:56

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 4.74 g (wet)	Extract ID: 23D0653-03 A
	Preparation Batch: BLD0798	Final Volume: 40 g	Dry Weight: 3.84 g
	Prepared: 04/27/2023		% Solids: 81.10

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.42	0.42	1.48	mg/kg NH3-N	



Friedman & Bruya Inc.
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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG2-0
23D0653-05 (Solid)

Butyl Tins

Method: EPA 8270E-SIM
Instrument: NT12 Analyst: JZ

Sampled: 04/24/2023 09:30
Analyzed: 05/15/2023 18:41

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 3546 (Microwave) Extract ID: 23D0653-05 A 01
Preparation Batch: BLE0004 Sample Size: 6.27 g (wet) Dry Weight: 5.00 g
Prepared: 05/03/2023 Final Volume: 0.5 mL % Solids: 79.72

Sample Cleanup: Cleanup Method: Silica Gel Extract ID: 23D0653-05 A 01
Cleanup Batch: CLE0133 Initial Volume: 0.5 uL
Cleaned: 12-May-2023 Final Volume: 0.5 uL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Tributyltin Ion	36643-28-4	1	0.450	3.86	7.43	ug/kg	
Dibutyltin Ion	14488-53-0	1	1.73	5.78	14.5	ug/kg	
Butyltin Ion	78763-54-9	1	1.89	4.08	5.82	ug/kg	
Tetrabutyltin	1461-25-2	1	5.00	5.00	ND	ug/kg	U
Surrogate: Tripentyltin					30-160 %	94.4 %	
Surrogate: Tripropyltin					30-160 %	88.2 %	



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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG2-0
23D0653-05 (Solid)

Wet Chemistry

Method: EPA 9034

Sampled: 04/24/2023 09:30

Instrument: S2 Buret Analyst: CDE

Analyzed: 05/06/2023 19:01

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Sample Size: 5.083 g (wet)	Extract ID: 23D0653-05 B
	Preparation Batch: BLD0825	Final Volume: 100 mL	Dry Weight: 3.65 g
	Prepared: 04/29/2023		% Solids: 71.83

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfide	18496-25-8	1	27.4	27.4	293	mg/kg	



Friedman & Bruya Inc.
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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG2-0
23D0653-05 (Solid)

Wet Chemistry

Method: PSEP 1986

Sampled: 04/24/2023 09:30

Instrument: BAL2 Analyst: UW

Analyzed: 04/27/2023 15:35

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 23D0653-05
	Preparation Batch: BLD0789	Final Volume: 5 g	Dry Weight: 3.80 g
	Prepared: 04/27/2023		% Solids: 76.05

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids, Sulfide		1	0.04	0.04	71.83	%	



Friedman & Bruya Inc.
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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG2-0
23D0653-05 (Solid)

Wet Chemistry

Method: SM 2540 G-97

Sampled: 04/24/2023 09:30

Instrument: BAL2 Analyst: UW

Analyzed: 04/28/2023 15:27

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 23D0653-05
	Preparation Batch: BLD0819	Final Volume: 5 g	Dry Weight: 3.80 g
	Prepared: 04/28/2023		% Solids: 76.05

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	76.05	%	



Friedman & Bruya Inc.
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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG2-0
23D0653-05RE2 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-97

Sampled: 04/24/2023 09:30

Instrument: LACHAT1 Analyst: MAM

Analyzed: 04/28/2023 14:14

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: No Prep Wet Chem

Extract ID: 23D0653-05RE2 A

Preparation Batch: BLD0798

Sample Size: 4.23 g (wet)

Dry Weight: 3.22 g

Prepared: 04/27/2023

Final Volume: 40 g

% Solids: 76.05

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	2	0.99	0.99	13.1	mg/kg NH3-N	D



Friedman & Bruya Inc.
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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG2-10
23D0653-06 (Solid)

Butyl Tins

Method: EPA 8270E-SIM

Sampled: 04/24/2023 10:30

Instrument: NT12 Analyst: JZ

Analyzed: 05/15/2023 18:58

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Sample Size: 6.07 g (wet)	Extract ID: 23D0653-06 A 01
	Preparation Batch: BLE0004	Final Volume: 0.5 mL	Dry Weight: 5.00 g
	Prepared: 05/03/2023		% Solids: 82.41
Sample Cleanup:	Cleanup Method: Silica Gel	Initial Volume: 0.5 uL	Extract ID: 23D0653-06 A 01
	Cleanup Batch: CLE0133	Final Volume: 0.5 uL	
	Cleaned: 12-May-2023		

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Tributyltin Ion	36643-28-4	1	0.450	3.86	ND	ug/kg	U
Dibutyltin Ion	14488-53-0	1	1.73	5.78	ND	ug/kg	U
Butyltin Ion	78763-54-9	1	1.89	4.08	ND	ug/kg	U
Tetrabutyltin	1461-25-2	1	5.00	5.00	ND	ug/kg	U
<i>Surrogate: Triphenyltin</i>					30-160 %	89.1	%
<i>Surrogate: Tripropyltin</i>					30-160 %	87.7	%



Friedman & Bruya Inc.
3012 16th Avenue West
Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG2-10
23D0653-06 (Solid)

Wet Chemistry

Method: EPA 9034

Instrument: S2 Buret Analyst: CDE

Sampled: 04/24/2023 10:30

Analyzed: 05/06/2023 19:01

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Sample Size: 5.235 g (wet)	Extract ID: 23D0653-06 B
	Preparation Batch: BLD0825	Final Volume: 100 mL	Dry Weight: 4.07 g
	Prepared: 04/29/2023		% Solids: 77.80

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfide	18496-25-8	1	24.6	24.6	ND	mg/kg	U



Friedman & Bruya Inc.
3012 16th Avenue West
Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG2-10
23D0653-06 (Solid)

Wet Chemistry

Method: PSEP 1986

Sampled: 04/24/2023 10:30

Instrument: BAL2 Analyst: UW

Analyzed: 04/27/2023 15:35

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 23D0653-06
	Preparation Batch: BLD0789	Final Volume: 5 g	Dry Weight: 3.98 g
	Prepared: 04/27/2023		% Solids: 79.60

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids, Sulfide		1	0.04	0.04	77.80	%	



Friedman & Bruya Inc.
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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG2-10
23D0653-06 (Solid)

Wet Chemistry

Method: SM 2540 G-97

Sampled: 04/24/2023 10:30

Instrument: BAL2 Analyst: UW

Analyzed: 04/28/2023 15:27

Analysis by: Analytical Resources, LLC

Sample Preparation:

Preparation Method: No Prep Wet Chem

Extract ID: 23D0653-06

Preparation Batch: BLD0819

Sample Size: 5 g (wet)

Dry Weight: 3.98 g

Prepared: 04/28/2023

Final Volume: 5 g

% Solids: 79.60

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	79.60	%	



Friedman & Bruya Inc.
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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

PG2-10
23D0653-06 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-97
Instrument: LACHAT1 Analyst: MAM

Sampled: 04/24/2023 10:30
Analyzed: 04/28/2023 13:59

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 4.2 g (wet)	Extract ID: 23D0653-06 A
	Preparation Batch: BLD0798	Final Volume: 40 g	Dry Weight: 3.34 g
	Prepared: 04/27/2023		% Solids: 79.60

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.48	0.48	1.32	mg/kg NH3-N	



Friedman & Bruya Inc.
3012 16th Avenue West
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Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

Analysis by: Analytical Resources, LLC

Butyl Tins - Quality Control

Batch BLE0004 - EPA 8270E-SIM

Instrument: NT12 Analyst: JZ

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLE0004-BLK1)					Prepared: 03-May-2023 Analyzed: 15-May-2023 17:14						
Tributyltin Ion	ND	0.450	3.86	ug/kg							U
Dibutyltin Ion	ND	1.73	5.78	ug/kg							U
Butyltin Ion	ND	1.89	4.08	ug/kg							U
Tetrabutyltin	ND	5.00	5.00	ug/kg							U
<i>Surrogate: Triphenyltin</i>	41.2			ug/kg	45.2		91.3	30-160			
<i>Surrogate: Tripropyltin</i>	36.8			ug/kg	43.7		84.1	30-160			
LCS (BLE0004-BS1)					Prepared: 03-May-2023 Analyzed: 15-May-2023 17:31						
Tributyltin Ion	44.9	0.450	3.86	ug/kg	44.6		101	30-160			
Dibutyltin Ion	27.1	1.73	5.78	ug/kg	38.4		70.6	30-160			
Butyltin Ion	18.7	1.89	4.08	ug/kg	31.2		59.9	30-160			
<i>Surrogate: Triphenyltin</i>	41.7			ug/kg	45.2		92.3	30-160			
<i>Surrogate: Tripropyltin</i>	38.7			ug/kg	43.7		88.5	30-160			
Matrix Spike (BLE0004-MS1)					Source: 23D0653-06 Prepared: 03-May-2023 Analyzed: 15-May-2023 19:16						
Tributyltin Ion	45.6	0.450	3.86	ug/kg	44.5	ND	102	30-160			
Dibutyltin Ion	27.7	1.73	5.78	ug/kg	38.3	ND	72.2	30-160			
Butyltin Ion	19.3	1.89	4.08	ug/kg	31.1	ND	61.9	30-160			
<i>Surrogate: Triphenyltin</i>	39.9			ug/kg	45.2	40.2	88.3	30-160			
<i>Surrogate: Tripropyltin</i>	39.9			ug/kg	43.7	38.4	91.3	30-160			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Matrix Spike Dup (BLE0004-MSD1)					Source: 23D0653-06 Prepared: 03-May-2023 Analyzed: 15-May-2023 19:33						
Tributyltin Ion	47.4	0.450	3.86	ug/kg	44.5	ND	107	30-160	4.03	30	
Dibutyltin Ion	38.6	1.73	5.78	ug/kg	38.3	ND	101	30-160	32.80	30	*
Butyltin Ion	54.8	1.89	4.08	ug/kg	31.1	ND	176	30-160	95.90	30	*
<i>Surrogate: Triphenyltin</i>	38.9			ug/kg	45.2	40.2	86.2	30-160			
<i>Surrogate: Tripropyltin</i>	38.7			ug/kg	43.7	38.4	88.5	30-160			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



Friedman & Bruya Inc.
3012 16th Avenue West
Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

Analysis by: Analytical Resources, LLC

Wet Chemistry - Quality Control

Batch BLD0789 - PSEP 1986

Instrument: BAL2 Analyst: UW

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
Blank (BLD0789-BLK1)										
						Prepared: 27-Apr-2023 Analyzed: 27-Apr-2023 15:35				
Total Solids, Sulfide	ND	0.04	0.04	%						U
Duplicate (BLD0789-DUP1)										
		Source: 23D0653-01				Prepared: 27-Apr-2023 Analyzed: 27-Apr-2023 15:35				
Total Solids, Sulfide	75.06	0.04	0.04	%		71.70		4.59	20	



Friedman & Bruya Inc.
3012 16th Avenue West
Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

Analysis by: Analytical Resources, LLC

Wet Chemistry - Quality Control

Batch BLD0798 - SM 4500-NH3 H-97

Instrument: LACHAT1 Analyst: MAM

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
Blank (BLD0798-BLK1)					Prepared: 27-Apr-2023 Analyzed: 28-Apr-2023 13:49					
Ammonia-N	ND	0.40	0.40	mg/kg NH3-N						U
LCS (BLD0798-BS1)					Prepared: 27-Apr-2023 Analyzed: 28-Apr-2023 13:50					
Ammonia-N	96.8	8.00	8.00	mg/kg NH3-N	100	96.8	90-110			D
Duplicate (BLD0798-DUP1)					Source: 23D0653-01 Prepared: 27-Apr-2023 Analyzed: 28-Apr-2023 13:53					
Ammonia-N	2.22	0.47	0.47	mg/kg NH3-N		2.38		6.97	20	
Matrix Spike (BLD0798-MS1)					Source: 23D0653-01 Prepared: 27-Apr-2023 Analyzed: 28-Apr-2023 13:54					
Ammonia-N	118	0.45	10.2	mg/kg NH3-N	127	2.38	90.8	75-125		D

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



Friedman & Bruya Inc.
3012 16th Avenue West
Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

Analysis by: Analytical Resources, LLC

Wet Chemistry - Quality Control

Batch BLD0819 - SM 2540 G-97

Instrument: BAL2 Analyst: UW

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD Limit	Notes
Blank (BLD0819-BLK1)									
Prepared: 28-Apr-2023 Analyzed: 28-Apr-2023 16:02									
Total Solids	ND	0.04	0.04	%					U



Friedman & Bruya Inc.
3012 16th Avenue West
Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

Analysis by: Analytical Resources, LLC

Wet Chemistry - Quality Control

Batch BLD0825 - EPA 9034

Instrument: S2 Buret Analyst: CDE

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
Blank (BLD0825-BLK1)										
Prepared: 29-Apr-2023 Analyzed: 06-May-2023 19:01										
Sulfide	ND	20.0	20.0	mg/kg						U
LCS (BLD0825-BS1)										
Prepared: 29-Apr-2023 Analyzed: 06-May-2023 19:01										
Sulfide	192	20.0	20.0	mg/kg	196		98.0	75-125		



Friedman & Bruya Inc.
3012 16th Avenue West
Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

Certified Analyses included in this Report

Analyte	Certifications
EPA 8270E-SIM in Solid	
Tributyltin Ion	WADOE, DoD-ELAP, NELAP
Dibutyltin Ion	WADOE, DoD-ELAP, NELAP
Butyltin Ion	WADOE, NELAP
Tetrabutyltin	NELAP
EPA 9034 in Solid	
Sulfide	NELAP
SM 4500-NH3 H-97 in Solid	
Ammonia-N	WADOE, NELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	03/28/2025
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program, PJLA Testing	66169	02/28/2025
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-012	05/12/2023
WADOE	WA Dept of Ecology	C558	06/30/2023
WA-DW	Ecology - Drinking Water	C558	06/30/2023



Friedman & Bruya Inc.
3012 16th Avenue West
Seattle WA, 98119-2029

Project: 304363
Project Number: [none]
Project Manager: Michael Erdahl

Reported:
31-May-2023 18:25

Notes and Definitions

*	Flagged value is not within established control limits.
D	The reported value is from a dilution
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL)
J	Estimated concentration value detected below the reporting limit.
U	This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.

APPENDIX IV – FILL SOIL STOCKPILE REMOVAL

Figure 4-1 – Fill Stockpile Soil Sample Locations

Table 4-1 – Fill Stockpile Soil Sampling Results – Total Metals

Table 4-2 – Fill Stockpile Soil Sampling Results – TCLP Metals

Table 4-3 – Fill Stockpile Soil Sampling Results – PAHs

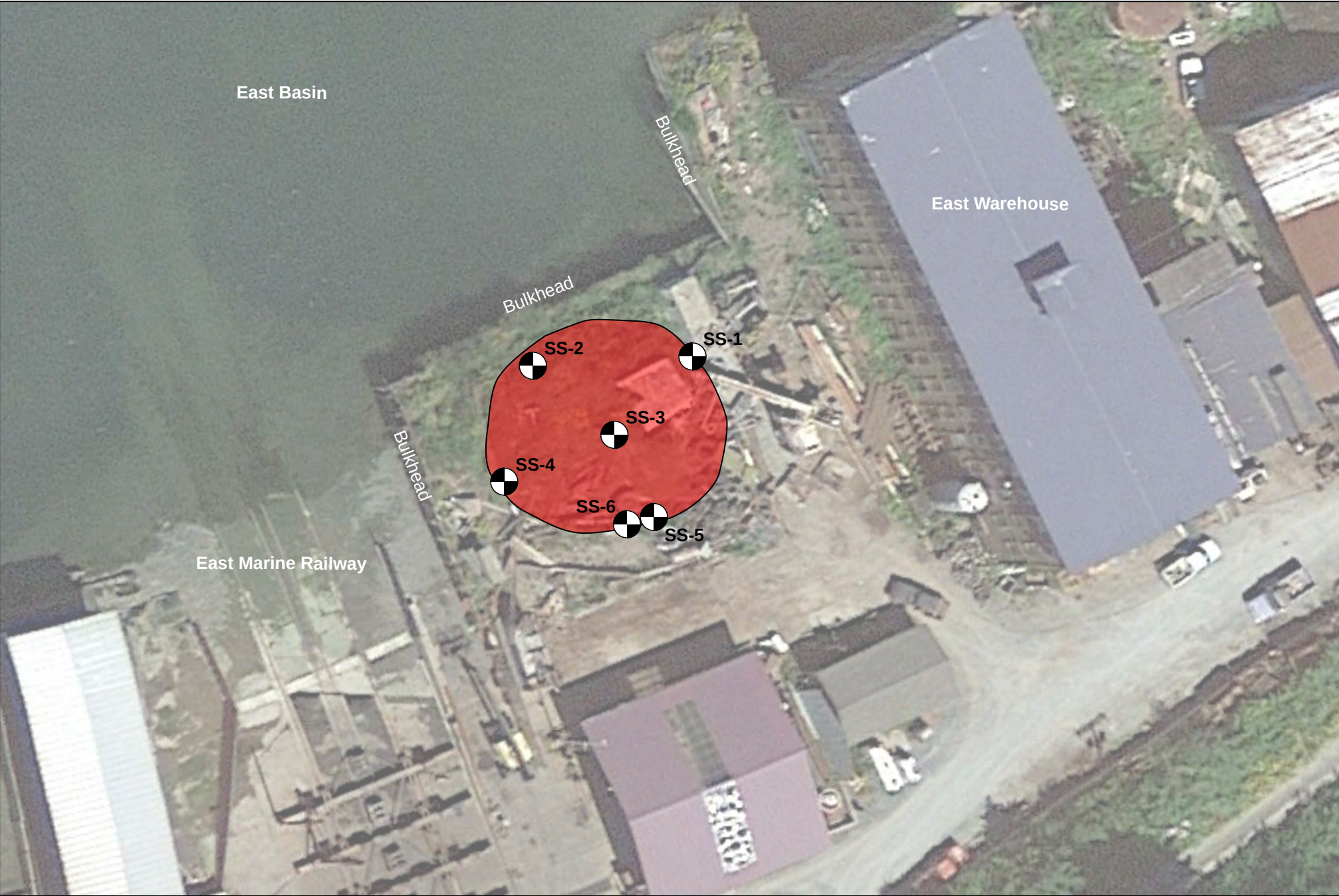
Laboratory Reports & Chain-of-Custody's

- TCLP Metals (April 10, 2023)
- Total Metals (May 2, 2023)
- PAHs (May 5, 2023)

Dangerous Waste Characterization (Rainier Environmental – (May 22, 2023)

Site Photos of Fill Soil Stockpile

Soil Disposal Tickets



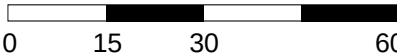
Key  Sampling location - ss-1 Sample ID  Soil stockpile	Fill Stockpile Soil Sample Locations Lovric's Sea-Craft 3100 Oakes Avenue Anacortes, WA 98221	Figure 4-1  0 15 30 60 Feet	 N  STRATUM GROUP
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Table 4-1: Fill Stockpile Soil Sampling Results – Total Metals

Sample ID	SS-1	SS-2	SS-3	SS-4	SS-5	
Sample Date	3/30/2023					
Contaminant Concentrations (mg/kg)						
Arsenic	25.3	16.5	27.4	20.4	23.6	
Barium	44.4	36.2	44.8	27.1	52.3	
Cadmium	1.17	U<1	1.79	U<1	U<1	
Chromium	31.5	16.6	32.7	21.4	21.5	
Lead	236	54.8	212	127	86.6	
Mercury	1.14	U<1	U<1	U<1	U<1	
Selenium	U<1	U<1	U<1	U<1	U<1	
Silver	U<1	U<1	U<1	U<1	U<1	
Copper	617	208	428	252	155	
Nickel	49.9	20.5	36.4	24.2	27.8	
Zinc	689	278	970	426	417	

Table 4-2: Fill Stockpile Soil Sampling Results – TCLP Metals

Sample ID	SS-1	SS-2	SS-3	SS-4	SS-5	TCLP Limit
Sample Date	3/30/2023					
Contaminant Concentrations (mg/kg)						
Arsenic	U<1	U<1	U<1	U<1	U<1	5.0
Barium	U<1	U<1	U<1	U<1	U<1	100
Cadmium	U<1	U<1	U<1	U<1	U<1	1.0
Chromium	U<1	U<1	U<1	U<1	U<1	5.0
Lead	U<1	U<1	U<1	U<1	U<1	5.0
Mercury	U<0.1	U<0.1	U<0.1	U<0.1	U<0.1	0.2
Selenium	U<1	U<1	U<1	U<1	U<1	1.0
Silver	U<1	U<1	U<1	U<1	U<1	5.0
Copper	U<5	U<5	U<5	U<5	U<5	
Nickel	U<1	U<1	U<1	U<1	U<1	
Zinc	U<5	U<5	U<5	U<5	U<5	

Table 4-3: Fill Stockpile Soil Sampling Results – PAHs

Sample ID	SS-1	SS-2	SS-3	SS-4	SS-5	
Sample Date	3/30/2023					
Contaminant Concentrations (mg/kg)						
Naphthalene	U<0.2	U<0.05	0.95	U<0.2	U<0.2	
2-Methylnaphthalene	U<0.2	U<0.05	0.90	U<0.2	U<0.2	
1-Methylnaphthalene	U<0.2	U<0.05	0.93	U<0.2	U<0.2	
Acenaphthylene	U<0.2	U<0.05	2.3	U<0.2	0.50	
Acenaphthene	U<0.2	0.070	1.1	U<0.2	0.24	
Fluorene	U<0.2	0.086	4.7	U<0.2	0.38	
Phenanthrene	1.7	1.0	28	0.30	3.2	
Anthracene	0.44	0.60	7.9	U<0.2	2.6	
Fluoranthene	5.5	2.9	28	1.6	16	
Pyrene	4.9	2.6	27	1.5	15	
Benz(a)anthracene	2.2	1.2	12	0.81	8.0	
Chrysene	3.7	2.2	13	1.6	19	
Benzo(a)pyrene	2.5	1.3	11	1.5	7.3	
Benzo(b)fluoranthene	3.9	1.9	13	2.2	15	
Benzo(k)fluoranthene	1.4	0.64	4.8	0.76	4.6	
Indeno(1,2,3-cd)pyrene	1.5	0.70	5.2	1.1	4.4	
Dibenz(a,h)anthracene	0.35	0.18	0.99	0.24	0.94	
Benzo(g,h,i)perylene	1.5	0.62	4.4	1.3	3.5	

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Vineta Mills, M.S.
Eric Young, B.S.

5500 4th Avenue South
Seattle, WA 98108
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

April 10, 2023

Ben Carlson, Project Manager
Stratum Group
2102 Young St
Bellingham, WA 98225

Dear Mr Carlson:

Included are the results from the testing of material submitted on March 31, 2023 from the Stabbert, F&BI 303535 project. There are 9 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl
Project Manager

Enclosures
STG0410R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on March 31, 2023 by Friedman & Bruya, Inc. from the Stratum Group Stabbert, F&BI 303535 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>Stratum Group</u>
303535 -01	SS-1
303535 -02	SS-2
303535 -03	SS-3
303535 -04	SS-4
303535 -05	SS-5

All quality control requirements were acceptable.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	SS-1	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	04/05/23	Lab ID:	303535-01
Date Analyzed:	04/06/23	Data File:	303535-01.138
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Copper	<5	
Lead	<1	5.0
Mercury	<0.1	0.2
Nickel	<1	
Selenium	<1	1.0
Silver	<1	5.0
Zinc	<5	

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	SS-2	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	04/05/23	Lab ID:	303535-02
Date Analyzed:	04/06/23	Data File:	303535-02.139
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Copper	<5	
Lead	<1	5.0
Mercury	<0.1	0.2
Nickel	<1	
Selenium	<1	1.0
Silver	<1	5.0
Zinc	<5	

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	SS-3	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	04/05/23	Lab ID:	303535-03
Date Analyzed:	04/06/23	Data File:	303535-03.140
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Copper	<5	
Lead	<1	5.0
Mercury	<0.1	0.2
Nickel	<1	
Selenium	<1	1.0
Silver	<1	5.0
Zinc	<5	

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	SS-4	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	04/05/23	Lab ID:	303535-04
Date Analyzed:	04/06/23	Data File:	303535-04.141
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Copper	<5	
Lead	<1	5.0
Mercury	<0.1	0.2
Nickel	<1	
Selenium	<1	1.0
Silver	<1	5.0
Zinc	<5	

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	SS-5	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	04/05/23	Lab ID:	303535-05
Date Analyzed:	04/06/23	Data File:	303535-05.142
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Copper	<5	
Lead	<1	5.0
Mercury	<0.1	0.2
Nickel	<1	
Selenium	<1	1.0
Silver	<1	5.0
Zinc	<5	

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	Method Blank	Client:	Stratum Group
Date Received:	Not Applicable	Project:	Stabbert, F&BI 303535
Date Extracted:	04/05/23	Lab ID:	I3-264 mb
Date Analyzed:	04/06/23	Data File:	I3-264 mb.113
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Copper	<5	
Lead	<1	5.0
Mercury	<0.1	0.2
Nickel	<1	
Selenium	<1	1.0
Silver	<1	5.0
Zinc	<5	

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 04/10/23

Date Received: 03/31/23

Project: Stabbert, F&BI 303535

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL/SOLID SAMPLES FOR TCLP METALS USING EPA METHODS 6020B AND 1311

Laboratory Code: 304047-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	mg/L (ppm)	1.0	<1	97	95	75-125	2
Barium	mg/L (ppm)	5.0	<1	99 b	98 b	75-125	1 b
Cadmium	mg/L (ppm)	0.5	<1	99	97	75-125	2
Chromium	mg/L (ppm)	2.0	<1	93	90	75-125	3
Copper	mg/L (ppm)	2.0	<5	94	91	75-125	3
Lead	mg/L (ppm)	1.0	<1	85	84	75-125	1
Mercury	mg/L (ppm)	1.0	<0.1	77	76	75-125	1
Nickel	mg/L (ppm)	2.0	<1	94	91	75-125	3
Selenium	mg/L (ppm)	0.5	<1	97	97	75-125	0
Silver	mg/L (ppm)	0.5	<1	89	77	75-125	14
Zinc	mg/L (ppm)	5.0	<5	95	92	75-125	3

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	mg/L (ppm)	1.0	98	80-120
Barium	mg/L (ppm)	5.0	92	80-120
Cadmium	mg/L (ppm)	0.5	94	80-120
Chromium	mg/L (ppm)	2.0	94	80-120
Copper	mg/L (ppm)	2.0	97	80-120
Lead	mg/L (ppm)	1.0	93	80-120
Mercury	mg/L (ppm)	1.0	84	80-120
Nickel	mg/L (ppm)	2.0	94	80-120
Selenium	mg/L (ppm)	0.5	91	80-120
Silver	mg/L (ppm)	0.5	85	80-120
Zinc	mg/L (ppm)	5.0	96	80-120

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria, biased high; or, the calibration results for the analyte were outside of acceptance criteria, biased high, with a detection for the analyte in the sample. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the standard reporting limit. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

k - The calibration results for the analyte were outside of acceptance criteria, biased high, and the analyte was not detected in the sample.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

Report to Ben Carlson

Company the Schrader Group

Address 2102 Yang St

City, State, ZIP Bethlehem, PA 18020

Phone 360-714-9409 Email ben@stratungroup.net

SAMPLE CHAIN OF CUSTODY

03/31/23

M2

Page # _____ of _____

TURNAROUND TIME

☒ Standard turnaround

- RUSH

Rush charges authorized by:

SAMPLE DISPOSAL

- ☐ Archive samples

Default: Dispose after 30 days

SAMPLERS (signature) 	
PROJECT NAME Shabert	PO #
REMARKS Project specific RLS? - Yes / No	INVOICE TO Shaden

TURNAROUND TIME
☒ Standard turnaround
☐ RUSH
 Rush charges authorized by: _____

SAMPLE DISPOSAL
☐ Archive samples
☐ Other _____
 Default: Dispose after 30 days

[illegible]

Friedman & Bruya, Inc.
Ph. (206) 285-8282

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: 	Ben Carlson	Shadon Group	3/30/23	1700
Received by: FeedEx			3/31	
Relinquished by:				
Received by: 	ANH PHAN	FB	03/31/23	14:17

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Vineta Mills, M.S.
Eric Young, B.S.

5500 4th Avenue South
Seattle, WA 98108
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

May 2, 2023

Ben Carlson, Project Manager
Stratum Group
2102 Young St
Bellingham, WA 98225

Dear Mr Carlson:

Included are the additional results from the testing of material submitted on March 31, 2023 from the Stabbert, F&BI 303535 project. There are 14 pages included in this report.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl
Project Manager

Enclosures
STG0502R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on March 31, 2023 by Friedman & Bruya, Inc. from the Stratum Group Stabbert, F&BI 303535 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>Stratum Group</u>
303535 -01	SS-1
303535 -02	SS-2
303535 -03	SS-3
303535 -04	SS-4
303535 -05	SS-5

All quality control requirements were acceptable.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	SS-1	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	04/26/23	Lab ID:	303535-01
Date Analyzed:	04/26/23	Data File:	303535-01.123
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
----------	------------------------------

Arsenic	25.3
Barium	44.4
Cadmium	1.17
Mercury	1.14
Selenium	<1
Silver	<1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	SS-1	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	04/26/23	Lab ID:	303535-01 x10
Date Analyzed:	04/27/23	Data File:	303535-01 x10.052
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
----------	------------------------------

Chromium	31.5
Copper	617
Lead	236
Nickel	49.9
Zinc	689

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	SS-2	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	04/26/23	Lab ID:	303535-02
Date Analyzed:	04/26/23	Data File:	303535-02.124
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
----------	------------------------------

Arsenic	16.5
Barium	36.2
Cadmium	<1
Lead	54.8
Mercury	<1
Selenium	<1
Silver	<1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	SS-2	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	04/26/23	Lab ID:	303535-02 x5
Date Analyzed:	04/27/23	Data File:	303535-02 x5.053
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
----------	------------------------------

Chromium	16.6
Copper	208
Nickel	20.5
Zinc	278

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	SS-3	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	04/26/23	Lab ID:	303535-03
Date Analyzed:	04/26/23	Data File:	303535-03.125
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
----------	------------------------------

Arsenic	27.4
Barium	44.8
Cadmium	1.79
Mercury	<1
Selenium	<1
Silver	<1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	SS-3	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	04/26/23	Lab ID:	303535-03 x10
Date Analyzed:	04/27/23	Data File:	303535-03 x10.054
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
----------	------------------------------

Chromium	32.7
Copper	428
Lead	212
Nickel	36.4
Zinc	970

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	SS-4	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	04/26/23	Lab ID:	303535-04
Date Analyzed:	04/26/23	Data File:	303535-04.135
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
----------	------------------------------

Arsenic	20.4
Barium	27.1
Cadmium	<1
Mercury	<1
Selenium	<1
Silver	<1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	SS-4	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	04/26/23	Lab ID:	303535-04 x5
Date Analyzed:	04/27/23	Data File:	303535-04 x5.055
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
----------	------------------------------

Chromium	21.4
Copper	252
Lead	127
Nickel	24.2
Zinc	426

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	SS-5	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	04/26/23	Lab ID:	303535-05
Date Analyzed:	04/26/23	Data File:	303535-05.136
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
----------	------------------------------

Arsenic	23.6
Barium	52.3
Cadmium	<1
Lead	86.6
Mercury	<1
Selenium	<1
Silver	<1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	SS-5	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	04/26/23	Lab ID:	303535-05 x5
Date Analyzed:	04/27/23	Data File:	303535-05 x5.056
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
----------	------------------------------

Chromium	21.5
Copper	155
Nickel	27.8
Zinc	417

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Stratum Group
Date Received:	Not Applicable	Project:	Stabbert, F&BI 303535
Date Extracted:	04/25/23	Lab ID:	I3-321 mb
Date Analyzed:	04/26/23	Data File:	I3-321 mb.041
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
----------	------------------------------

Arsenic	<1
Barium	<1
Cadmium	<1
Chromium	<1
Copper	<5
Lead	<1
Mercury	<1
Nickel	<1
Selenium	<1
Silver	<1
Zinc	<5

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 05/02/23

Date Received: 03/31/23

Project: Stabbert, F&BI 303535

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 304340-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	mg/kg (ppm)	10	2.12	99 b	92 b	75-125	7 b
Barium	mg/kg (ppm)	50	33.6	114 b	98 b	75-125	15 b
Cadmium	mg/kg (ppm)	10	<1	100	96	75-125	4
Chromium	mg/kg (ppm)	50	15.5	99 b	89 b	75-125	11 b
Copper	mg/kg (ppm)	50	11.5	87 b	83 b	75-125	5 b
Lead	mg/kg (ppm)	50	3.60	93	88	75-125	6
Mercury	mg/kg (ppm)	5	<1	95	92	75-125	3
Nickel	mg/kg (ppm)	25	16.6	92 b	78 b	75-125	16 b
Selenium	mg/kg (ppm)	5	<1	94	89	75-125	5
Silver	mg/kg (ppm)	10	<1	99	96	75-125	3
Zinc	mg/kg (ppm)	50	19.4	87 b	81 b	75-125	7 b

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	mg/kg (ppm)	10	87	80-120
Barium	mg/kg (ppm)	50	94	80-120
Cadmium	mg/kg (ppm)	10	93	80-120
Chromium	mg/kg (ppm)	50	95	80-120
Copper	mg/kg (ppm)	50	97	80-120
Lead	mg/kg (ppm)	50	96	80-120
Mercury	mg/kg (ppm)	5	98	80-120
Nickel	mg/kg (ppm)	25	90	80-120
Selenium	mg/kg (ppm)	5	88	80-120
Silver	mg/kg (ppm)	10	95	80-120
Zinc	mg/kg (ppm)	50	94	80-120

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria, biased high; or, the calibration results for the analyte were outside of acceptance criteria, biased high, with a detection for the analyte in the sample. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the standard reporting limit. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

k - The calibration results for the analyte were outside of acceptance criteria, biased high, and the analyte was not detected in the sample.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

Ben Carlson

Company Shaden Group

Address 2102 Young St

City, State, ZIP Bellingham, WA 98225

Phone 360-714-9406 Email ben@shdungrwp.net

SAMPLE CHAIN OF CUSTODY

03/31/23

142

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Page # <u>1</u> of <u>1</u>	
SAMPLERS (signature) <u>[Signature]</u>	TURNAROUND TIME ☒ Standard turnaround ☐ RUSH _____ Rush charges authorized by: _____
PROJECT NAME <u>Slabbert</u>	PO # _____
REMARKS <u>Shaden</u>	INVOICE TO <u>Shaden</u>
SAMPLE DISPOSAL ☐ Archive samples ☐ Other _____ Default: Dispose after 30 days	
Project specific RLS? - Yes / No	

[illegible]

Friedman & Bruya, Inc.
Ph. (206) 285-8282

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: 	Ben Carlson	Shadon Group	3/30/23	1700
Received by: FeoEx			3/31/23	
Relinquished by:				
Received by: 	ANH PHAN	FGB	03/31/23	14:17

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Vineta Mills, M.S.
Eric Young, B.S.

5500 4th Avenue South
Seattle, WA 98108
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

May 5, 2023

Ben Carlson, Project Manager
Stratum Group
2102 Young St
Bellingham, WA 98225

Dear Mr Carlson:

Included are the additional results from the testing of material submitted on March 31, 2023 from the Stabbert, F&BI 303535 project. There are 9 pages included in this report.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl
Project Manager

Enclosures
STG0505R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on March 31, 2023 by Friedman & Bruya, Inc. from the Stratum Group Stabbert, F&BI 303535 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>Stratum Group</u>
303535 -01	SS-1
303535 -02	SS-2
303535 -03	SS-3
303535 -04	SS-4
303535 -05	SS-5

The samples were requested outside of the holding time for the analysis. The data were flagged accordingly.

All other quality control requirements were acceptable.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	SS-1 ht	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	05/03/23	Lab ID:	303535-01 1/100
Date Analyzed:	05/03/23	Data File:	050318.D
Matrix:	Soil	Instrument:	GCMS12
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Nitrobenzene-d5	78 d	16	137
2-Fluorobiphenyl	86 d	46	122
2,4,6-Tribromophenol	103 d	17	154
Terphenyl-d14	98 d	31	167

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.2
2-Methylnaphthalene	<0.2
1-Methylnaphthalene	<0.2
Acenaphthylene	<0.2
Acenaphthene	<0.2
Fluorene	<0.2
Phenanthrene	1.7
Anthracene	0.44
Fluoranthene	5.5
Pyrene	4.9
Benz(a)anthracene	2.2
Chrysene	3.7
Benzo(a)pyrene	2.5
Benzo(b)fluoranthene	3.9
Benzo(k)fluoranthene	1.4
Indeno(1,2,3-cd)pyrene	1.5
Dibenz(a,h)anthracene	0.35
Benzo(g,h,i)perylene	1.5

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	SS-2 ht	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	05/03/23	Lab ID:	303535-02 1/25
Date Analyzed:	05/03/23	Data File:	050319.D
Matrix:	Soil	Instrument:	GCMS12
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Nitrobenzene-d5	87 d	16	137
2-Fluorobiphenyl	94 d	46	122
2,4,6-Tribromophenol	99 d	17	154
Terphenyl-d14	112 d	31	167

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.05
Acenaphthene	0.070
Fluorene	0.086
Phenanthrene	1.0
Anthracene	0.60
Fluoranthene	2.9
Pyrene	2.6
Benz(a)anthracene	1.2
Chrysene	2.2
Benzo(a)pyrene	1.3
Benzo(b)fluoranthene	1.9
Benzo(k)fluoranthene	0.64
Indeno(1,2,3-cd)pyrene	0.70
Dibenz(a,h)anthracene	0.18
Benzo(g,h,i)perylene	0.62

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	SS-3 ht	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	05/03/23	Lab ID:	303535-03 1/100
Date Analyzed:	05/03/23	Data File:	050320.D
Matrix:	Soil	Instrument:	GCMS12
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Nitrobenzene-d5	78 d	16	137
2-Fluorobiphenyl	88 d	46	122
2,4,6-Tribromophenol	109 d	17	154
Terphenyl-d14	104 d	31	167

Compounds:	Concentration mg/kg (ppm)
Naphthalene	0.95
2-Methylnaphthalene	0.90
1-Methylnaphthalene	0.93
Acenaphthylene	2.3
Acenaphthene	1.1
Fluorene	4.7
Phenanthrene	28
Anthracene	7.9
Fluoranthene	28
Pyrene	27
Benz(a)anthracene	12
Chrysene	13
Benzo(a)pyrene	11
Benzo(b)fluoranthene	13
Benzo(k)fluoranthene	4.8
Indeno(1,2,3-cd)pyrene	5.2
Dibenz(a,h)anthracene	0.99
Benzo(g,h,i)perylene	4.4

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	SS-4 ht	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	05/03/23	Lab ID:	303535-04 1/100
Date Analyzed:	05/03/23	Data File:	050321.D
Matrix:	Soil	Instrument:	GCMS12
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Nitrobenzene-d5	70 d	16	137
2-Fluorobiphenyl	80 d	46	122
2,4,6-Tribromophenol	101 d	17	154
Terphenyl-d14	90 d	31	167

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.2
2-Methylnaphthalene	<0.2
1-Methylnaphthalene	<0.2
Acenaphthylene	<0.2
Acenaphthene	<0.2
Fluorene	<0.2
Phenanthrene	0.30
Anthracene	<0.2
Fluoranthene	1.6
Pyrene	1.5
Benz(a)anthracene	0.81
Chrysene	1.6
Benzo(a)pyrene	1.5
Benzo(b)fluoranthene	2.2
Benzo(k)fluoranthene	0.76
Indeno(1,2,3-cd)pyrene	1.1
Dibenz(a,h)anthracene	0.24
Benzo(g,h,i)perylene	1.3

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	SS-5 ht	Client:	Stratum Group
Date Received:	03/31/23	Project:	Stabbert, F&BI 303535
Date Extracted:	05/03/23	Lab ID:	303535-05 1/100
Date Analyzed:	05/04/23	Data File:	050407.D
Matrix:	Soil	Instrument:	GCMS9
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Nitrobenzene-d5	66 d	10	198
2-Fluorobiphenyl	90 d	45	117
2,4,6-Tribromophenol	99 d	11	158
Terphenyl-d14	108 d	50	124

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.2
2-Methylnaphthalene	<0.2
1-Methylnaphthalene	<0.2
Acenaphthylene	0.50
Acenaphthene	0.24
Fluorene	0.38
Phenanthrene	3.2
Anthracene	2.6
Fluoranthene	16
Pyrene	15
Benz(a)anthracene	8.0
Chrysene	19
Benzo(a)pyrene	7.3
Benzo(b)fluoranthene	15
Benzo(k)fluoranthene	4.6
Indeno(1,2,3-cd)pyrene	4.4
Dibenz(a,h)anthracene	0.94
Benzo(g,h,i)perylene	3.5

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank	Client:	Stratum Group
Date Received:	Not Applicable	Project:	Stabbert, F&BI 303535
Date Extracted:	05/03/23	Lab ID:	03-1057 mb2 1/5
Date Analyzed:	05/03/23	Data File:	050316.D
Matrix:	Soil	Instrument:	GCMS12
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Nitrobenzene-d5	93	16	137
2-Fluorobiphenyl	101	46	122
2,4,6-Tribromophenol	104	17	154
Terphenyl-d14	112	31	167

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Acenaphthylene	<0.01
Acenaphthene	<0.01
Fluorene	<0.01
Phenanthrene	<0.01
Anthracene	<0.01
Fluoranthene	<0.01
Pyrene	<0.01
Benz(a)anthracene	<0.01
Chrysene	<0.01
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01
Benzo(g,h,i)perylene	<0.01

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 05/05/23

Date Received: 03/31/23

Project: Stabbert, F&BI 303535

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: 305010-01 1/5 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	mg/kg (ppm)	0.83	<0.01	71	79	50-150	11
2-Methylnaphthalene	mg/kg (ppm)	0.83	<0.01	75	84	50-150	11
1-Methylnaphthalene	mg/kg (ppm)	0.83	<0.01	75	84	50-150	11
Acenaphthylene	mg/kg (ppm)	0.83	<0.01	77	87	50-150	12
Acenaphthene	mg/kg (ppm)	0.83	<0.01	75	86	50-150	14
Fluorene	mg/kg (ppm)	0.83	<0.01	79	90	50-150	13
Phenanthrene	mg/kg (ppm)	0.83	0.027	77	87	10-170	12
Anthracene	mg/kg (ppm)	0.83	<0.01	78	90	37-139	14
Fluoranthene	mg/kg (ppm)	0.83	0.082	78	90	10-203	14
Pyrene	mg/kg (ppm)	0.83	0.081	78	90	10-208	14
Benz(a)anthracene	mg/kg (ppm)	0.83	0.041	80	93	37-146	15
Chrysene	mg/kg (ppm)	0.83	0.098	75	90	36-144	18
Benzo(a)pyrene	mg/kg (ppm)	0.83	0.042	79	89	40-150	12
Benzo(b)fluoranthene	mg/kg (ppm)	0.83	0.13	74	90	45-157	20
Benzo(k)fluoranthene	mg/kg (ppm)	0.83	0.042	78	87	50-150	11
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	0.83	0.039	54	69	24-145	24 vo
Dibenz(a,h)anthracene	mg/kg (ppm)	0.83	<0.01	56	69	31-137	21 vo
Benzo(g,h,i)perylene	mg/kg (ppm)	0.83	0.031	47	60	14-141	24 vo

Laboratory Code: Laboratory Control Sample 1/5

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Naphthalene	mg/kg (ppm)	0.83	88	59-105
2-Methylnaphthalene	mg/kg (ppm)	0.83	91	62-108
1-Methylnaphthalene	mg/kg (ppm)	0.83	91	62-108
Acenaphthylene	mg/kg (ppm)	0.83	96	61-111
Acenaphthene	mg/kg (ppm)	0.83	95	61-110
Fluorene	mg/kg (ppm)	0.83	96	62-114
Phenanthrene	mg/kg (ppm)	0.83	94	64-112
Anthracene	mg/kg (ppm)	0.83	97	63-111
Fluoranthene	mg/kg (ppm)	0.83	100	66-115
Pyrene	mg/kg (ppm)	0.83	98	65-112
Benz(a)anthracene	mg/kg (ppm)	0.83	99	64-116
Chrysene	mg/kg (ppm)	0.83	99	66-119
Benzo(a)pyrene	mg/kg (ppm)	0.83	94	62-116
Benzo(b)fluoranthene	mg/kg (ppm)	0.83	94	61-118
Benzo(k)fluoranthene	mg/kg (ppm)	0.83	93	65-119
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	0.83	95	64-130
Dibenz(a,h)anthracene	mg/kg (ppm)	0.83	90	67-131
Benzo(g,h,i)perylene	mg/kg (ppm)	0.83	92	67-126

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria, biased high; or, the calibration results for the analyte were outside of acceptance criteria, biased high, with a detection for the analyte in the sample. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the standard reporting limit. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

k - The calibration results for the analyte were outside of acceptance criteria, biased high, and the analyte was not detected in the sample.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.



Dangerous Waste Characterization

Sample ID: SS-6

Report date: May 22, 2023

Submitted to:

Stratum Group
2102 Young Street
Bellingham, WA 98225

1.0 INTRODUCTION

A dangerous waste characterization using the test organism *Oncorhynchus mykiss* (rainbow trout) was conducted on one sample submitted by Stratum Group to Rainier Environmental. Testing was conducted following the Washington State Department of Ecology Publication 80-12.

2.0 METHODS

The sample, identified as SS-6 was received in the laboratory on May 16, 2023. Upon arrival at the laboratory the sample was inspected and contents verified against information provided on the chain-of-custody form. The sample was stored at 4°C in the dark until use. The test procedure is outlined in Table 1.

Table 1. Summary of Dangerous Waste Characterization Test Conditions

Parameter	Standard Fish Toxicity Test
Test number	2305-026
Sample ID	SS-6
Test initiation date; time	5/17/2023; 1030h
Test termination date; time	5/21/2023; 1030h
Endpoint	Mortality at 96-hours
Test chamber	7.5 L plastic tank
Test temperature	12 ± 1°C
Dilution water	Moderately hard synthetic water
Test solution volume	6 L
Test concentrations (mg/L)	100, 10, 0
Number of organisms/chamber	10
Number of replicates	3
Test organism	<i>Oncorhynchus mykiss</i> (rainbow trout)
Feeding	No feeding during test
Photoperiod	16 hours light/ 8 hours dark
Extraction	Rotary agitation (30 +/- 2 rpm) for 18 hours
Reference Toxicant	Copper sulfate
Deviations	None

The test organisms used in the test are outlined in Table 2. The samples were tested using fish received on May 2, 2023.

Table 2. Test organisms (*Oncorhynchus mykiss*)

Test organism age	44 days post swim-up (hatch date 3/13/2023)
Mean weight	0.38 g
Mean length	37 mm
Ratio of longest to shortest	1.2
Loading	0.63 g/L
Test organism source	Trout Lodge; Sumner, WA

3.0 RESULTS

A summary of results for the dangerous waste characterization conducted on sample SS-6 is contained in Table 3. There was no mortality during the test. Based on these results, the sample does not designate as either a dangerous or extremely hazardous waste. Copies of the laboratory bench sheets, statistical summaries of reference toxicant tests, and chain-of-custody form are provided in Appendices A through C.

Table 3. Summary of Results

Sample ID	Concentration (mg/L)	Survival (# fish, N=30)	Percent Mortality	Dangerous Waste Designation
Control	0	30	0	NA
SS-6	10	30	0	None
	100	30	0	

4.0 QUALITY ASSURANCE

The most recently completed reference toxicant test was initiated May 15, 2023. The LC₅₀ of 115 g/L copper fell within the acceptable range of mean $\pm$ two standard deviations of historical test results indicating that the test organisms were of an appropriate degree of sensitivity. The coefficient of variation (CV) for the last 20 tests was 31.3 percent, which is considered excellent by the Biomonitoring Science Advisory Board.

5.0 REFERENCES

- WDOE. 2016. Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria. Washington State Department of Ecology. Water Quality Program. Publication number: WQ-R-95-80, Revised June 2016.
- WDOE. 2020. Biological Testing Methods 80-12 for the Designation of Dangerous Waste. Washington State Department of Ecology. Hazardous Waste and Toxics Reduction Program. Publication number: 80-12, Revised September 2020.

Appendix A
***Oncorhynchus mykiss* Dangerous Waste Toxicity Test**
Raw Bench Sheets

Dangerous Waste Toxicity Test

Start Date & Time: 5/17/2023 1030

End Date & Time: 5/21/2023 1030

Test Organism: *Oncorhynchus mykiss*

Test Protocol: Washington State Department of Ecology Publ. 80-12

Rep	Conc.	Cont #	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (units)					Conductivity (umhos/cm)					Temperature (°C)					Percent Survival	
			0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96		
1	CON	16	10	10	10	10	10	8.5	8.1	7.8	7.5	7.2	8.00	1.84	1.57	7.44	7.27	297						303	11.9	12.1	11.7	12.3	11.8
2		1	10	10	10	10	10	8.9	8.6	8.1	7.9	7.5	8.06	1.86	1.59	7.39	7.31	299						304					
3		27	10	10	10	10	10	8.8	8.4	8.2	8.1	7.9	8.01	1.89	1.56	7.43	7.24	294						298					
1	10 PPM	26	10	10	10	10	10	8.6	8.3	8.0	7.9	7.7	8.04	1.84	1.61	7.37	7.24	291						295	11.8	12.2	11.9	12.3	12.0
2		18	10	10	10	10	10	9.0	8.7	8.4	8.4	8.1	8.03	1.81	1.59	7.41	7.27	297						303					
3		7	10	10	10	10	10	9.1	8.6	8.3	8.1	8.0	8.07	1.85	1.62	7.39	7.26	293						294					
1	100 PPM	24	10	10	10	10	10	8.8	8.5	8.1	8.0	7.6	8.06	1.81	1.63	7.40	7.31	294						299	11.9	12.3	12.0	12.1	11.9
2		5	10	10	10	10	10	9.0	8.7	8.5	8.3	8.1	8.00	1.89	1.66	7.38	7.27	290						294					
3		11	10	10	10	10	10	8.7	8.4	8.3	8.2	8.1	8.03	1.85	1.58	7.42	7.31	296						291					
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Handwritten signature: *John F. Kennedy*

6.07

Date of Hatch:	3/13	2023
Date of Swim up:	4/3	2023

Sample	Alk. (init.)	Hard. (init.)	Alk. (fin.)	Hard. (fin.)	Chlorine (mg/L Cl ₂)
	(mg/L as CaCO ₃)				
Control	68	92	68	92	40.03
100ppm	68	92	68	92	Weights (g):
					Lengths (mm):
					Length max

Date of Hatch:	3/13	2023
Date of Swim up:	4/3	2023

$\mu =$ <u>28</u>	Rainier Environmental
$\mu =$ <u>37</u>	Washington Laboratory

○

QA Check 97

Appendix B
Reference Toxicant Test
Control Chart and Statistical Summary

Fish 96-h Acute Survival Test

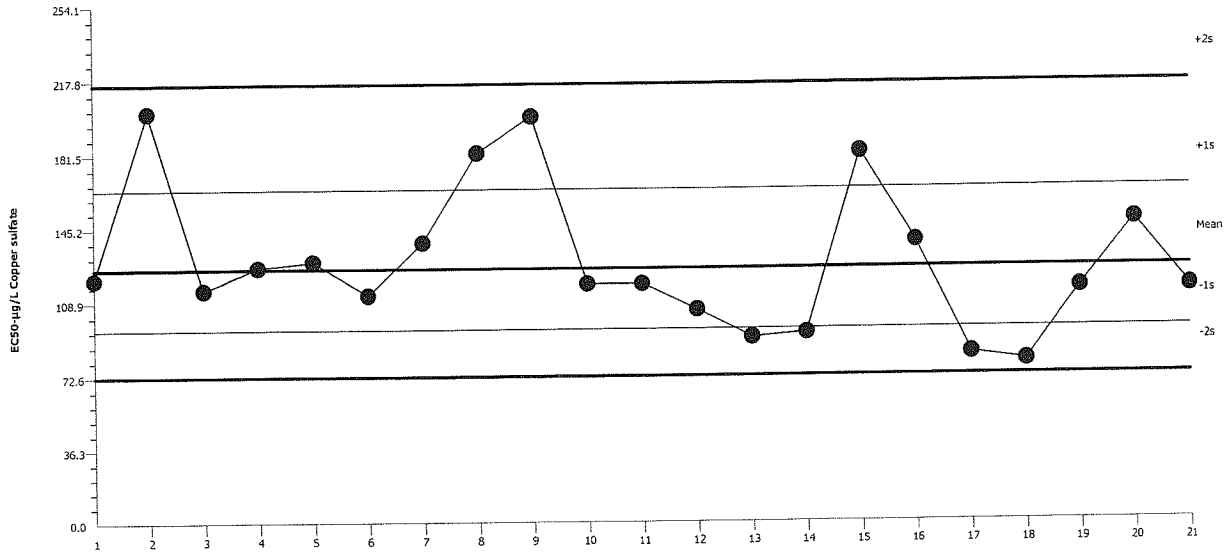
Rainier Environmental Laboratory

Test Type: Survival (96h)
Protocol: Not Applicable

Organism: Oncorhynchus mykiss (Rainbow Tro
Endpoint: 96h Survival Rate

Material: Copper sulfate
Source: Reference Toxicant-REF

Fish 96-h Acute Survival Test



Quality Control Data

Point	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2021	Sep	6	120.3	-4.908	-0.1468			05-9967-6128	07-2600-9766
2		Oct	4	202.2	76.97	1.758	(+)		19-8922-3248	13-1559-3159
3		Nov	5	114.9	-10.34	-0.3163			04-8669-6249	15-6834-1433
4		Dec	6	126	0.7811	0.02282			13-8732-0751	08-1557-4326
5	2022	Jan	5	128.9	3.726	0.1076			08-2261-8669	03-7761-6146
6		Feb	5	112.2	-12.96	-0.4011			01-7899-0440	09-8784-8920
7		Mar	7	138.2	12.98	0.362			15-8880-5349	18-5703-0746
8		Apr	11	182.3	57.13	1.379	(+)		19-4475-1025	00-2732-4149
9		May	11	200	74.79	1.719	(+)		04-3686-1214	17-7144-4708
10		Jun	13	117.6	-7.656	-0.2315			02-1194-6933	14-6655-2671
11		Jul	11	117.6	-7.656	-0.2315			18-9490-6426	20-8229-8763
12		Aug	12	104.7	-20.48	-0.6555			16-1269-6384	20-8498-8487
13		Sep	14	91.17	-34.04	-1.164	(-)		21-3997-4244	00-3631-7496
14		Oct	10	93.3	-31.91	-1.079	(-)		01-3925-6404	03-9134-1193
15		Nov	14	182.3	57.13	1.379	(+)		09-0829-7750	07-1545-0995
16		Dec	12	138.2	12.98	0.362			02-0643-2090	02-3247-9401
17	2023	Jan	12	83.12	-42.09	-1.503	(-)		10-5717-9012	06-2162-7195
18		Feb	13	79.37	-45.84	-1.673	(-)		19-2977-9552	20-0081-1333
19		Mar	13	114.9	-10.34	-0.3163			14-1992-9075	20-3196-8530
20		Apr	14	148.1	22.9	0.6163			00-0643-4903	11-5830-8594
21		May	15	114.9	-10.34	-0.3163			06-5181-9947	15-0207-5859

CETIS Summary Report

Report Date: 22 May-23 10:11 (p 1 of 1)

Test Code: RA051523OM | 06-5181-9947

Fish 96-h Acute Survival Test

Rainier Environmental Laboratory

Batch ID: 03-1324-2453 Test Type: Survival (96h)
 Start Date: 15 May-23 10:15 Protocol: Not Applicable
 Ending Date: 19 May-23 10:15 Species: Oncorhynchus mykiss
 Duration: 96h Source: Trout Lodge Fish Farm

Analyst: Eric Tollefson
 Diluent: Mod-Hard Synthetic Water
 Brine:
 Age: 42d

Sample ID: 08-8734-5798 Code: RA051523OM
 Sample Date: 15 May-23 Material: Copper sulfate
 Receive Date: 15 May-23 Source: Reference Toxicant
 Sample Age: 10h Station: In House

Client: Internal Lab
 Project:

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
18-8251-7403	96h Survival Rate	50	100	70.71	11.9%		Dunnett Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	µg/L	95% LCL	95% UCL	TU	Method
15-0207-5859	96h Survival Rate	LC50	114.9	98.8	133.6		Spearman-Kärber

96h Survival Rate Summary

C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	1	1	1	1	1	0	0	0.0%	0.0%
25		3	1	1	1	1	1	0	0	0.0%	0.0%
50		3	0.9667	0.9451	0.9882	0.9	1	0.03333	0.05774	5.97%	3.33%
100		3	0.6333	0.5902	0.6765	0.5	0.7	0.06667	0.1155	18.23%	36.67%
200		3	0.1	0.06266	0.1373	0	0.2	0.05774	0.1	100.0%	90.0%
400		3	0	0	0	0	0	0	0		100.0%

96h Survival Rate Detail

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	1	1
25		1	1	1
50		1	0.9	1
100		0.7	0.5	0.7
200		0.1	0	0.2
400		0	0	0

96h Survival Rate Binomials

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	10/10	10/10	10/10
25		10/10	10/10	10/10
50		10/10	9/10	10/10
100		7/10	5/10	7/10
200		1/10	0/10	2/10
400		0/10	0/10	0/10

Appendix C
Chain-of-Custody Form

Washington
5013 Pacific Highway East, Suite 20 Five
WA 98424
Phone: 253.922.8898

Chain of Custody

Date 5/15/23 Page 1 of 1

[illegible]

Site Photos of Fill Soil Stockpile



View of the soil stockpile. Note separated piles of creosote piles and tires.



Sample location SS-1 on the northeast portion of the stockpile.



View of the north side of the stockpile and sampling location SS-2.



View of the soil collected from SS-2.



View from the top of the stockpile and sampling location SS-3.



Soil from sampling location SS-4.



View of the south side of the stockpile and sampling location SS-5.



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185965
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/12/2023 Vehicle# 25 Volume
Payment Type Credit Account Container
Manual Ticket# Driver BUCK NELSON
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
Time Scale Operator Inbound Gross 105200 lb
In 06/12/2023 14:30:30 SCALE 1 GALTHEIM Tare 39460 lb
Out 06/12/2023 14:30:30 GALTHEIM Net 65740 lb
Tons 32.87
Comments NW-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	32.87	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	32.87	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185919
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/09/2023 Vehicle# 3 HATER Volume
Payment Type Credit Account Container
Manual Ticket# Driver TOM
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
Time Scale Operator Inbound Gross 101400 lb
In 06/09/2023 09:33:18 SCALE 1 galtheim Tare 40740 lb
Out 06/09/2023 09:33:18 galtheim Net 60660 lb
Tons 30.33
Comments HATER-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	30.33	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	30.33	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature

TOM



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185910
Ph: 206 763 5025

Customer Name	STABBERT MARINE AND INDUST ST	Carrier	SELF HAULER *	Volume
Ticket Date	06/09/2023	Vehicle#	GW16	
Payment Type	Credit Account	Container		
Manual Ticket#		Driver	JAKE BAKER	
Route	AK	Check#		
Hauling Ticket#		Billing#	0000876	
Destination		Grid		
PO#	1399540R			
In	Time 06/09/2023 07:22:42	Scale	Operator	Inbound
Out	06/09/2023 07:22:42	SCALE 1	galtheim	Gross
			galtheim	Tare
				Net
				Tons
Comments	GREAT-GA			

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	30.25	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				
3 GONDOLA T-GONDOLA TON	100	30.25	Tons				

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185937
Ph: 206 763 5025

Customer Name	STABBERT MARINE AND INDUST ST	Carrier	SELF HAULER *	Volume
Ticket Date	06/09/2023	Vehicle#	GW10	
Payment Type	Credit Account	Container		
Manual Ticket#		Driver	KEVIN MEYERS	
Route	AK	Check#		
Hauling Ticket#		Billing#	0000876	
Destination		Grid		
PO#	1399540R			
In	Time 06/09/2023 12:43:45	Scale	SCALE 1	Operator
Out	06/09/2023 12:43:45			galtheim
				galtheim
			Inbound	Gross 102480 lb
				Tare 40600 lb
				Net 61880 lb
				Tons 30.94
Comments	GREAT-GA			

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	30.94	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	30.94	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185954
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/12/2023 Vehicle# 2 HAYTER Volume
Payment Type Credit Account Container
Manual Ticket# Driver KENT
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
In Time Scale Operator Inbound Gross 106860 lb*
06/12/2023 09:54:10 SCALE 1 galtheim Tare 38260 lb*
Out 06/12/2023 09:54:10 galtheim Net 68600 lb
* Manual Weight Tons 34.30
Comments HAYTER-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	34.30	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	34.30	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185907
Ph: 206 763 5025

Customer Name	STABBERT MARINE AND INDUST ST	Carrier	SELF HAULER *	Volume
Ticket Date	06/09/2023	Vehicle#	GW10	
Payment Type	Credit Account	Container		
Manual Ticket#		Driver	KEVIN MEYERS	
Route	AK	Check#		
Hauling Ticket#		Billing#	0000876	
Destination		Grid		
PO#	1399540R			
In	Time 06/09/2023 07:13:27	Scale	Operator	Inbound
Out	06/09/2023 07:13:27	SCALE 1	galtheim	Gross
			galtheim	Tare
				Net
				Tons
Comments	GREAT-GA			

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	31.51	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	31.51	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185898
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/08/2023 Vehicle# 3 HATER Volume
Payment Type Credit Account Container
Manual Ticket# Driver TOM
Route Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R

	Time	Scale	Operator	Inbound	Gross	
In	06/08/2023 10:10:25	SCALE 1	galtheim		Tare	99640 lb
Out	06/08/2023 10:21:35	SCALE 1	galtheim		Net	40740 lb
					Tons	58900 lb
						29.45

Comments HATER-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	29.45	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	29.45	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature

Tom



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185896
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/08/2023 Vehicle# 5 HATER Volume
Payment Type Credit Account Container
Manual Ticket# Driver ANDY
Route Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
Time Scale Operator Inbound Gross 99540 lb
In 06/08/2023 09:44:20 SCALE 1 galtheim Tare 40320 lb
Out 06/08/2023 09:56:54 SCALE 1 galtheim Net 59220 lb
Tons 29.61
Comments HATER-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	29.61	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	29.61	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185955
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/12/2023 Vehicle# 25 Volume
Payment Type Credit Account Container
Manual Ticket# Driver BUCK NELSON
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
In Time Scale Operator Inbound Gross 94980 lb*
06/12/2023 10:06:26 SCALE 1 galtheim Tare 39460 lb*
Out 06/12/2023 10:06:26 galtheim Net 55520 lb
* Manual Weight Tons 27.76
Comments NW-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	27.76	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	27.76	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185899
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/08/2023 Vehicle# 11 HATER Volume
Payment Type Credit Account Container
Manual Ticket# Driver STEVE PEPPLS
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
In Time Scale Operator Inbound Gross 106520 lb
06/08/2023 10:29:14 SCALE 1 galtheim Tare 43020 lb
Out 06/08/2023 10:44:18 SCALE 1 galtheim Net 63500 lb
Tons 31.75
Comments HATER-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	31.75	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	31.75	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185911
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/08/2023 Vehicle# 11 HATER Volume
Payment Type Credit Account Container
Manual Ticket# 65294 Driver STEVE PEPPLES
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
In Time Scale Operator Inbound Gross 103100 lb*
06/08/2023 03:46:00 SCALE 1 galtheim Tare 43020 lb*
Out 06/08/2023 03:46:00 galtheim Net 60080 lb
* Manual Weight Tons 30.04
Comments HATER-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	30.04	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	30.04	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature

Steve



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185936
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/09/2023 Vehicle# GW16 Volume
Payment Type Credit Account Container
Manual Ticket# Driver JAKE BAKER
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
Time Scale Operator Inbound Gross 102260 lb
In 06/09/2023 12:38:58 SCALE 1 galtheim Tare 41440 lb
Out 06/09/2023 12:38:58 galtheim Net 60820 lb
Tons 30.41
Comments GREAT-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	30.41	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				
3 GONDOLA T-GONDOLA TON	100	30.41	Tons				

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185918
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/09/2023 Vehicle# 5 HATER Volume
Payment Type Credit Account Container
Manual Ticket# Driver ANDY
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
Time Scale Operator Inbound Gross 100980 lb
In 06/09/2023 09:16:08 SCALE 1 galtheim Tare 40320 lb
Out 06/09/2023 09:16:08 galtheim Net 60660 lb
Tons 30.33
Comments HATER-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	30.33	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	30.33	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185956
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/12/2023 Vehicle# 16W Volume
Payment Type Credit Account Container
Manual Ticket# Driver JAMES SILVA
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
Time Scale Operator Inbound Gross 97520 lb
In 06/12/2023 10:30:17 SCALE 1 galtheim Tare 41340 lb
Out 06/12/2023 10:41:14 SCALE 1 galtheim Net 56180 lb
Tons 28.09
Comments WELWEST-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	28.09	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	28.09	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185963
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/12/2023 Vehicle# 3 HATER Volume
Payment Type Credit Account Container
Manual Ticket# Driver TOM
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
In Time Scale Operator Inbound Gross 106720 lb
06/12/2023 13:51:51 SCALE 1 GALTHEIM Tare 40740 lb
Out 06/12/2023 13:51:51 GALTHEIM Net 65980 lb
Tons 32.99
Comments HAYTER-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	32.99	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	32.99	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185952
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/12/2023 Vehicle# 3 HATER Volume
Payment Type Credit Account Container
Manual Ticket# Driver TOM
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
In Time Scale Operator Inbound Gross 107720 lb
06/12/2023 09:18:12 SCALE 1 galtheim Tare 40740 lb
Out 06/12/2023 09:18:12 galtheim Net 66980 lb
Tons 33.49
Comments HAYTER-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	33.49	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	33.49	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185908
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/08/2023 Vehicle# 5 HATER Volume
Payment Type Credit Account Container
Manual Ticket# 65292 Driver ANDY
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
In Time Scale Operator Inbound Gross 100260 lb*
06/08/2023 03:04:00 SCALE 1 galtheim Tare 40320 lb*
Out 06/08/2023 03:04:00 galtheim Net 59940 lb
* Manual Weight Tons 29.97
Comments HATER-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	29.97	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	29.97	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature

Andy



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185966
Ph: 206 763 5025

Customer Name	STABBERT MARINE AND INDUST ST	Carrier	SELF HAULER *	Volume
Ticket Date	06/12/2023	Vehicle#	16W	
Payment Type	Credit Account	Container		
Manual Ticket#		Driver	JAMES SILVA	
Route	AK	Check#		
Hauling Ticket#		Billing#	0000876	
Destination		Grid		
PO#	1399540R			
In	Time 06/12/2023 15:05:09	Scale	SCALE 1	Operator
Out	06/12/2023 15:05:09			GALTHEIM
				GALTHEIM
			Inbound	Gross 102380 lb
				Tare 41340 lb
				Net 61040 lb
				Tons 30.52
Comments	WELWEST-GA			

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	30.52	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	30.52	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185964
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/12/2023 Vehicle# 2 HAYTER Volume
Payment Type Credit Account Container
Manual Ticket# Driver KENT
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
In Time Scale Operator Inbound Gross 105280 lb
06/12/2023 13:57:16 SCALE 1 GALTHEIM Tare 38260 lb
Out 06/12/2023 13:57:16 GALTHEIM Net 67020 lb
Tons 33.51
Comments HAYTER-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	33.51	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	33.51	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185940
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/09/2023 Vehicle# 5 HATER Volume
Payment Type Credit Account Container
Manual Ticket# Driver ANDY
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
In Time Scale Operator Inbound Gross 94980 lb
06/09/2023 14:14:33 SCALE 1 GALTHEIM Tare 40320 lb
Out 06/09/2023 14:14:33 GALTHEIM Net 54660 lb
Tons 27.33
Comments HAYTER-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	27.33	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				
3 GONDOLA T-GONDOLA TON	100	27.33	Tons				

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185922
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/09/2023 Vehicle# 11 HATER Volume
Payment Type Credit Account Container
Manual Ticket# Driver STEVE PEPPLS
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
In Time Scale Operator Inbound Gross 104160 lb
06/09/2023 09:59:10 SCALE 1 galtheim Tare 43020 lb
Out 06/09/2023 09:59:10 galtheim Net 61140 lb
Tons 30.57
Comments HAYTER-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	30.57	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	30.57	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185941
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/09/2023 Vehicle# 3 HATER Volume
Payment Type Credit Account Container
Manual Ticket# Driver TOM
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
Time Scale Operator Inbound Gross 103020 lb
In 06/09/2023 14:24:50 SCALE 1 GALTHEIM Tare 40740 lb
Out 06/09/2023 14:24:50 GALTHEIM Net 62280 lb
Tons 31.14
Comments HAYTER-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	31.14	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	31.14	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature

Tom



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185943
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/09/2023 Vehicle# 11 HATER Volume
Payment Type Credit Account Container
Manual Ticket# Driver STEVE PEPPLS
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
In Time Scale Operator Inbound Gross 104240 lb
06/09/2023 15:20:23 SCALE 1 GALTHEIM Tare 43020 lb
Out 06/09/2023 15:20:23 GALTHEIM Net 61220 lb
Tons 30.61
Comments HAYTER-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	30.61	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	30.61	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185903
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/08/2023 Vehicle# GW10 Volume
Payment Type Credit Account Container
Manual Ticket# Driver KEVIN MEYERS
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
Time Scale Operator Inbound Gross 104340 lb
In 06/08/2023 11:29:06 SCALE 1 galtheim Tare 40600 lb
Out 06/08/2023 11:42:14 SCALE 1 galtheim Net 63740 lb
Tons 31.87
Comments GREAT WESTERN-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	31.87	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	31.87	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185909
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/08/2023 Vehicle# 3 HATER Volume
Payment Type Credit Account Container
Manual Ticket# 65293 Driver TOM
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
Time Scale Operator Inbound Gross 101206 lb*
In 06/08/2023 03:12:00 SCALE 1 galtheim Tare 40740 lb*
Out 06/08/2023 03:12:00 galtheim Net 60466 lb
* Manual Weight Tons 30.23
Comments HATER-JW

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	30.23	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	30.23	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature

Tom



Alaska Street
70 S Alaska Street
Seattle, WA, 98134

Reprint
Ticket# 185900
Ph: 206 763 5025

Customer Name STABBERT MARINE AND INDUST ST Carrier SELF HAULER *
Ticket Date 06/08/2023 Vehicle# GW16 Volume
Payment Type Credit Account Container
Manual Ticket# Driver JAKE BAKER
Route AK Check#
Hauling Ticket# Billing# 0000876
Destination Grid
PO# 1399540R
In Time Scale Operator Inbound Gross 104460 lb
06/08/2023 10:47:27 SCALE 1 galtheim Tare 41440 lb
Out 06/08/2023 10:57:55 SCALE 1 galtheim Net 63020 lb
Tons 31.51
Comments GREAT WESTERN-GA

Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1 Daily Cover-PCS-Tons-Pet	100	31.51	Tons				SKAGIT
2 ENERGY-Energy Surcharge	100		%				SKAGIT
3 GONDOLA T-GONDOLA TON	100	31.51	Tons				SKAGIT

Total Tax
Total Ticket

Driver`s Signature

APPENDIX V – WASTE DISPOSAL DOCUMENTATION

Tote Fluid Characterization Laboratory Report & Chain-of-Custody

Tote Fluid Disposal Bill of Lading

Tote Fluid Disposal Invoice

Paint Shed Hazardous Waste Disposal Tickets (WasteXpress)

Site Photos of Bilge Water Totes

Site Photos of Hazardous Waste Identified for Disposal

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Vineta Mills, M.S.
Eric Young, B.S.

5500 4th Avenue South
Seattle, WA 98108
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

May 4, 2023

Ben Carlson, Project Manager
Stratum Group
2102 Young St
Bellingham, WA 98225

Dear Mr Carlson:

Included are the results from the testing of material submitted on April 26, 2023 from the Stabbert Totes, F&BI 304362 project. There are 22 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl
Project Manager

Enclosures
STG0504R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on April 26, 2023 by Friedman & Bruya, Inc. from the Stratum Group Stabbert Totes, F&BI 304362 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>Stratum Group</u>
304362 -01	Tote Comp 1
304362 -02	Tote Comp 2

The 8260D calibration standard failed the acceptance criteria for acetone. The data were flagged accordingly.

The 8270E calibration standard failed the acceptance criteria for benzoic acid and hexachlorocyclopentadiene. The data were flagged accordingly.

All other quality control requirements were acceptable.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 05/04/23

Date Received: 04/26/23

Project: Stabbert Totes, F&BI 304362

Date Extracted: 04/28/23

Date Analyzed: 04/28/23

**RESULTS FROM THE ANALYSIS OF WATER SAMPLES
FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE
USING METHOD NWTPH-Gx**
Results Reported as ug/L (ppb)

<u>Sample ID</u> Laboratory ID	<u>Gasoline Range</u>	Surrogate (% Recovery) (Limit 50-150)
Tote Comp 1 304362-01 1/100	25,000 x	113
Tote Comp 2 304362-02 1/100	11,000 x	112
Method Blank 03-937 MB	<100	102

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 05/04/23

Date Received: 04/26/23

Project: Stabbert Totes, F&BI 304362

Date Extracted: 04/28/23

Date Analyzed: 04/28/23

**RESULTS FROM THE ANALYSIS OF WATER SAMPLES
FOR TOTAL PETROLEUM HYDROCARBONS AS
DIESEL AND MOTOR OIL
USING METHOD NWTPH-Dx**

Results Reported as ug/L (ppb)

<u>Sample ID</u> Laboratory ID	<u>Diesel Range</u> (C ₁₀ -C ₂₅)	<u>Motor Oil Range</u> (C ₂₅ -C ₃₆)	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 41-152)
Tote Comp 1 304362-01 1/10	140,000	49,000	ip
Tote Comp 2 304362-02 1/100	460,000	230,000	ip
Method Blank 03-1042 MB2	<50	<250	109

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 200.8

Client ID:	Tote Comp 1	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Totes, F&BI 304362
Date Extracted:	04/28/23	Lab ID:	304362-01 x5
Date Analyzed:	04/28/23	Data File:	304362-01 x5.126
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	20.8
Barium	160
Cadmium	<5
Chromium	32.4
Copper	324
Lead	7.44
Mercury	<2
Nickel	35.3
Silver	<5
Zinc	2,160

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 200.8

Client ID:	Tote Comp 1	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Totes, F&BI 304362
Date Extracted:	04/28/23	Lab ID:	304362-01 x20
Date Analyzed:	04/28/23	Data File:	304362-01 x20.112
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
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Selenium	44.5
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FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 200.8

Client ID:	Tote Comp 2	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Totes, F&BI 304362
Date Extracted:	04/28/23	Lab ID:	304362-02 x5
Date Analyzed:	04/28/23	Data File:	304362-02 x5.127
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	16.3
Barium	822
Cadmium	<5
Chromium	106
Copper	2,720
Lead	27.6
Mercury	<2
Nickel	124
Silver	<5

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 200.8

Client ID:	Tote Comp 2	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Totes, F&BI 304362
Date Extracted:	04/28/23	Lab ID:	304362-02 x20
Date Analyzed:	04/28/23	Data File:	304362-02 x20.113
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
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Selenium	37.9
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FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 200.8

Client ID:	Tote Comp 2	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Totes, F&BI 304362
Date Extracted:	04/28/23	Lab ID:	304362-02 x100
Date Analyzed:	05/01/23	Data File:	304362-02 x100.048
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
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Zinc	39,500
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FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 200.8

Client ID:	Method Blank	Client:	Stratum Group
Date Received:	NA	Project:	Stabbert Totes, F&BI 304362
Date Extracted:	04/28/23	Lab ID:	I3-326 mb2
Date Analyzed:	04/28/23	Data File:	I3-326 mb2.085
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Barium	<1
Cadmium	<1
Chromium	<1
Copper	<5
Lead	<1
Mercury	<0.4
Nickel	<1
Selenium	<1
Silver	<1
Zinc	<5

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	Tote Comp 1	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Totes, F&BI 304362
Date Extracted:	05/02/23	Lab ID:	304362-01 1/10
Date Analyzed:	05/02/23	Data File:	050221.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	71	132
Toluene-d8	102	68	139
4-Bromofluorobenzene	102	62	136

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<10	1,3-Dichloropropane	<10
Chloromethane	<100	Tetrachloroethene	<10
Vinyl chloride	<0.2	Dibromochloromethane	<5
Bromomethane	<50	1,2-Dibromoethane (EDB)	<10
Chloroethane	<10	Chlorobenzene	<10
Trichlorofluoromethane	<10	Ethylbenzene	290
Acetone	<500 ca	1,1,1,2-Tetrachloroethane	<10
1,1-Dichloroethene	<10	m,p-Xylene	750
Hexane	<50	o-Xylene	480
Methylene chloride	<50	Styrene	13
Methyl t-butyl ether (MTBE)	14	Isopropylbenzene	57
trans-1,2-Dichloroethene	<10	Bromoform	<50
1,1-Dichloroethane	<10	n-Propylbenzene	180
2,2-Dichloropropane	<10	Bromobenzene	<10
cis-1,2-Dichloroethene	<10	1,3,5-Trimethylbenzene	220
Chloroform	<10	1,1,2,2-Tetrachloroethane	<2
2-Butanone (MEK)	<200	1,2,3-Trichloropropane	<10
1,2-Dichloroethane (EDC)	<2	2-Chlorotoluene	<10
1,1,1-Trichloroethane	<10	4-Chlorotoluene	<10
1,1-Dichloropropene	<10	tert-Butylbenzene	<10
Carbon tetrachloride	<5	1,2,4-Trimethylbenzene	950
Benzene	160	sec-Butylbenzene	84
Trichloroethene	<5	p-Isopropyltoluene	51
1,2-Dichloropropane	<10	1,3-Dichlorobenzene	<10
Bromodichloromethane	<5	1,4-Dichlorobenzene	<10
Dibromomethane	<10	1,2-Dichlorobenzene	<10
4-Methyl-2-pentanone	<100	1,2-Dibromo-3-chloropropane	<100
cis-1,3-Dichloropropene	<4	1,2,4-Trichlorobenzene	<10
Toluene	760	Hexachlorobutadiene	<5
trans-1,3-Dichloropropene	<4	Naphthalene	35
1,1,2-Trichloroethane	<5	1,2,3-Trichlorobenzene	<10
2-Hexanone	<100		

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	Tote Comp 2	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Totes, F&BI 304362
Date Extracted:	05/02/23	Lab ID:	304362-02 1/10
Date Analyzed:	05/02/23	Data File:	050222.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	71	132
Toluene-d8	101	68	139
4-Bromofluorobenzene	101	62	136

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<10	1,3-Dichloropropane	<10
Chloromethane	<100	Tetrachloroethene	<10
Vinyl chloride	<0.2	Dibromochloromethane	<5
Bromomethane	<50	1,2-Dibromoethane (EDB)	<10
Chloroethane	<10	Chlorobenzene	<10
Trichlorofluoromethane	<10	Ethylbenzene	230
Acetone	2,100 ca	1,1,1,2-Tetrachloroethane	<10
1,1-Dichloroethene	<10	m,p-Xylene	520
Hexane	<50	o-Xylene	340
Methylene chloride	<50	Styrene	11
Methyl t-butyl ether (MTBE)	<10	Isopropylbenzene	37
trans-1,2-Dichloroethene	<10	Bromoform	<50
1,1-Dichloroethane	<10	n-Propylbenzene	110
2,2-Dichloropropane	<10	Bromobenzene	<10
cis-1,2-Dichloroethene	<10	1,3,5-Trimethylbenzene	130
Chloroform	<10	1,1,2,2-Tetrachloroethane	<2
2-Butanone (MEK)	640	1,2,3-Trichloropropane	<10
1,2-Dichloroethane (EDC)	<2	2-Chlorotoluene	<10
1,1,1-Trichloroethane	<10	4-Chlorotoluene	<10
1,1-Dichloropropene	<10	tert-Butylbenzene	<10
Carbon tetrachloride	<5	1,2,4-Trimethylbenzene	570
Benzene	120	sec-Butylbenzene	48
Trichloroethene	<5	p-Isopropyltoluene	30
1,2-Dichloropropane	<10	1,3-Dichlorobenzene	<10
Bromodichloromethane	<5	1,4-Dichlorobenzene	<10
Dibromomethane	<10	1,2-Dichlorobenzene	<10
4-Methyl-2-pentanone	<100	1,2-Dibromo-3-chloropropane	<100
cis-1,3-Dichloropropene	<4	1,2,4-Trichlorobenzene	<10
Toluene	570	Hexachlorobutadiene	<5
trans-1,3-Dichloropropene	<4	Naphthalene	25
1,1,2-Trichloroethane	<5	1,2,3-Trichlorobenzene	<10
2-Hexanone	<100		

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	Method Blank	Client:	Stratum Group
Date Received:	Not Applicable	Project:	Stabbert Totes, F&BI 304362
Date Extracted:	05/01/23	Lab ID:	03-0997 mb
Date Analyzed:	05/01/23	Data File:	050107.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	87	71	132
Toluene-d8	91	68	139
4-Bromofluorobenzene	104	62	136

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	<1
Vinyl chloride	<0.02	Dibromochloromethane	<0.5
Bromomethane	<5	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	<1
Trichlorofluoromethane	<1	Ethylbenzene	<1
Acetone	<50 ca	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Hexane	<5	o-Xylene	<1
Methylene chloride	<5	Styrene	<1
Methyl t-butyl ether (MTBE)	<1	Isopropylbenzene	<1
trans-1,2-Dichloroethene	<1	Bromoform	<5
1,1-Dichloroethane	<1	n-Propylbenzene	<1
2,2-Dichloropropane	<1	Bromobenzene	<1
cis-1,2-Dichloroethene	<1	1,3,5-Trimethylbenzene	<1
Chloroform	<1	1,1,2,2-Tetrachloroethane	<0.2
2-Butanone (MEK)	<20	1,2,3-Trichloropropane	<1
1,2-Dichloroethane (EDC)	<0.2	2-Chlorotoluene	<1
1,1,1-Trichloroethane	<1	4-Chlorotoluene	<1
1,1-Dichloropropene	<1	tert-Butylbenzene	<1
Carbon tetrachloride	<0.5	1,2,4-Trimethylbenzene	<1
Benzene	<0.35	sec-Butylbenzene	<1
Trichloroethene	<0.5	p-Isopropyltoluene	<1
1,2-Dichloropropane	<1	1,3-Dichlorobenzene	<1
Bromodichloromethane	<0.5	1,4-Dichlorobenzene	<1
Dibromomethane	<1	1,2-Dichlorobenzene	<1
4-Methyl-2-pentanone	<10	1,2-Dibromo-3-chloropropane	<10
cis-1,3-Dichloropropene	<0.4	1,2,4-Trichlorobenzene	<1
Toluene	<1	Hexachlorobutadiene	<0.5
trans-1,3-Dichloropropene	<0.4	Naphthalene	<1
1,1,2-Trichloroethane	<0.5	1,2,3-Trichlorobenzene	<1
2-Hexanone	<10		

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Tote Comp 1	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Totes, F&BI 304362
Date Extracted:	04/28/23	Lab ID:	304362-01 1/100
Date Analyzed:	04/28/23	Data File:	042818.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	67 d	11	65
Phenol-d6	69 d	11	65
Nitrobenzene-d5	123 d	11	173
2-Fluorobiphenyl	81 d	25	128
2,4,6-Tribromophenol	96 d	10	140
Terphenyl-d14	88 d	50	150

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Phenol	<200	2,6-Dinitrotoluene	<100
Bis(2-chloroethyl) ether	<20	3-Nitroaniline	<2,000
2-Chlorophenol	<200	Acenaphthene	<2
1,3-Dichlorobenzene	<20	2,4-Dinitrophenol	<600
1,4-Dichlorobenzene	<20	Dibenzofuran	<2
1,2-Dichlorobenzene	<20	2,4-Dinitrotoluene	<100
Benzyl alcohol	<200	4-Nitrophenol	<600
2,2'-Oxybis(1-chloropropane)	<20	Diethyl phthalate	<200
2-Methylphenol	<200	Fluorene	<2
Hexachloroethane	<20	4-Chlorophenyl phenyl ether	<20
N-Nitroso-di-n-propylamine	<20	N-Nitrosodiphenylamine	<20
3-Methylphenol + 4-Methylphenol	<400	4-Nitroaniline	<2,000
Nitrobenzene	<20	4,6-Dinitro-2-methylphenol	<600
Isophorone	<20	4-Bromophenyl phenyl ether	<20
2-Nitrophenol	<200	Hexachlorobenzene	<20
2,4-Dimethylphenol	<200	Pentachlorophenol	<100
Benzoic acid	<1,000 ca	Phenanthrene	4.1
Bis(2-chloroethoxy)methane	<20	Anthracene	<2
2,4-Dichlorophenol	<200	Carbazole	<2
1,2,4-Trichlorobenzene	<20	Di-n-butyl phthalate	<200
Naphthalene	21	Fluoranthene	<2
Hexachlorobutadiene	<20	Pyrene	4.9
4-Chloroaniline	<2,000	Benzyl butyl phthalate	<200
4-Chloro-3-methylphenol	<200	Benz(a)anthracene	<2
2-Methylnaphthalene	31	Chrysene	<2
1-Methylnaphthalene	29	Bis(2-ethylhexyl) phthalate	<320
Hexachlorocyclopentadiene	<60 ca	Di-n-octyl phthalate	<200
2,4,6-Trichlorophenol	<200	Benzo(a)pyrene	<2
2,4,5-Trichlorophenol	<200	Benzo(b)fluoranthene	<2
2-Chloronaphthalene	<20	Benzo(k)fluoranthene	<2
2-Nitroaniline	<100	Indeno(1,2,3-cd)pyrene	<2
Dimethyl phthalate	<200	Dibenz(a,h)anthracene	<2
Acenaphthylene	<2	Benzo(g,h,i)perylene	<4

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Tote Comp 2	Client:	Stratum Group
Date Received:	04/26/23	Project:	Stabbert Totes, F&BI 304362
Date Extracted:	04/28/23	Lab ID:	304362-02 1/100
Date Analyzed:	04/28/23	Data File:	042819.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	61 d	11	65
Phenol-d6	79 d	11	65
Nitrobenzene-d5	151 d	11	173
2-Fluorobiphenyl	91 d	25	128
2,4,6-Tribromophenol	111 d	10	140
Terphenyl-d14	98 d	50	150

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Phenol	<200	2,6-Dinitrotoluene	<100
Bis(2-chloroethyl) ether	<20	3-Nitroaniline	<2,000
2-Chlorophenol	<200	Acenaphthene	<2
1,3-Dichlorobenzene	<20	2,4-Dinitrophenol	<600
1,4-Dichlorobenzene	<20	Dibenzofuran	<2
1,2-Dichlorobenzene	<20	2,4-Dinitrotoluene	<100
Benzyl alcohol	<200	4-Nitrophenol	<600
2,2'-Oxybis(1-chloropropane)	<20	Diethyl phthalate	<200
2-Methylphenol	<200	Fluorene	<2
Hexachloroethane	<20	4-Chlorophenyl phenyl ether	<20
N-Nitroso-di-n-propylamine	<20	N-Nitrosodiphenylamine	<20
3-Methylphenol + 4-Methylphenol	<400	4-Nitroaniline	<2,000
Nitrobenzene	<20	4,6-Dinitro-2-methylphenol	<600
Isophorone	<20	4-Bromophenyl phenyl ether	<20
2-Nitrophenol	<200	Hexachlorobenzene	<20
2,4-Dimethylphenol	<200	Pentachlorophenol	<100
Benzoic acid	<1,000 ca	Phenanthrene	5.5
Bis(2-chloroethoxy)methane	<20	Anthracene	<2
2,4-Dichlorophenol	<200	Carbazole	<2
1,2,4-Trichlorobenzene	<20	Di-n-butyl phthalate	<200
Naphthalene	30	Fluoranthene	<2
Hexachlorobutadiene	<20	Pyrene	8.2
4-Chloroaniline	<2,000	Benzyl butyl phthalate	<200
4-Chloro-3-methylphenol	<200	Benz(a)anthracene	<2
2-Methylnaphthalene	43	Chrysene	<2
1-Methylnaphthalene	39	Bis(2-ethylhexyl) phthalate	<320
Hexachlorocyclopentadiene	<60 ca	Di-n-octyl phthalate	<200
2,4,6-Trichlorophenol	<200	Benzo(a)pyrene	<2
2,4,5-Trichlorophenol	<200	Benzo(b)fluoranthene	<2
2-Chloronaphthalene	<20	Benzo(k)fluoranthene	<2
2-Nitroaniline	<100	Indeno(1,2,3-cd)pyrene	<2
Dimethyl phthalate	<200	Dibenz(a,h)anthracene	<2
Acenaphthylene	<2	Benzo(g,h,i)perylene	<4

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank	Client:	Stratum Group
Date Received:	Not Applicable	Project:	Stabbert Totes, F&BI 304362
Date Extracted:	04/28/23	Lab ID:	03-1047 mb
Date Analyzed:	04/28/23	Data File:	042809.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	34	11	65
Phenol-d6	24	11	65
Nitrobenzene-d5	86	11	173
2-Fluorobiphenyl	81	25	128
2,4,6-Tribromophenol	82	10	140
Terphenyl-d14	106	50	150

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Phenol	<2	2,6-Dinitrotoluene	<1
Bis(2-chloroethyl) ether	<0.2	3-Nitroaniline	<20
2-Chlorophenol	<2	Acenaphthene	0.037 lc
1,3-Dichlorobenzene	<0.2	2,4-Dinitrophenol	<6
1,4-Dichlorobenzene	<0.2	Dibenzofuran	0.039 lc
1,2-Dichlorobenzene	<0.2	2,4-Dinitrotoluene	<1
Benzyl alcohol	<2	4-Nitrophenol	<6
2,2'-Oxybis(1-chloropropane)	<0.2	Diethyl phthalate	<2
2-Methylphenol	<2	Fluorene	0.034 lc
Hexachloroethane	<0.2	4-Chlorophenyl phenyl ether	<0.2
N-Nitroso-di-n-propylamine	<0.2	N-Nitrosodiphenylamine	<0.2
3-Methylphenol + 4-Methylphenol	<4	4-Nitroaniline	<20
Nitrobenzene	<0.2	4,6-Dinitro-2-methylphenol	<6
Isophorone	<0.2	4-Bromophenyl phenyl ether	<0.2
2-Nitrophenol	<2	Hexachlorobenzene	<0.2
2,4-Dimethylphenol	<2	Pentachlorophenol	<1
Benzoic acid	<10 ca	Phenanthrene	0.028 lc
Bis(2-chloroethoxy)methane	<0.2	Anthracene	<0.02
2,4-Dichlorophenol	<2	Carbazole	<0.02
1,2,4-Trichlorobenzene	<0.2	Di-n-butyl phthalate	<2
Naphthalene	<0.2	Fluoranthene	<0.02
Hexachlorobutadiene	<0.2	Pyrene	<0.02
4-Chloroaniline	<20	Benzyl butyl phthalate	<2
4-Chloro-3-methylphenol	<2	Benz(a)anthracene	<0.02
2-Methylnaphthalene	<0.2	Chrysene	<0.02
1-Methylnaphthalene	<0.2	Bis(2-ethylhexyl) phthalate	<3.2
Hexachlorocyclopentadiene	<0.6 ca	Di-n-octyl phthalate	<2
2,4,6-Trichlorophenol	<2	Benzo(a)pyrene	<0.02
2,4,5-Trichlorophenol	<2	Benzo(b)fluoranthene	<0.02
2-Chloronaphthalene	<0.2	Benzo(k)fluoranthene	<0.02
2-Nitroaniline	<1	Indeno(1,2,3-cd)pyrene	<0.02
Dimethyl phthalate	<2	Dibenz(a,h)anthracene	<0.02
Acenaphthylene	0.032 lc	Benzo(g,h,i)perylene	<0.04

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 05/04/23

Date Received: 04/26/23

Project: Stabbert Totes, F&BI 304362

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER
SAMPLES FOR TPH AS GASOLINE
USING METHOD NWTPH-G_x**

Laboratory Code: 304375-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Gasoline	ug/L (ppb)	<100	<100	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Gasoline	ug/L (ppb)	1,000	94	69-134

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 05/04/23

Date Received: 04/26/23

Project: Stabbert Totes, F&BI 304362

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER
SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS
DIESEL EXTENDED USING METHOD NWTPH-D_x**

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	100	116	70-130	15

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 05/04/23

Date Received: 04/26/23

Project: Stabbert Totes, F&BI 304362

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: 304375-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	<1	91	97	70-130	6
Barium	ug/L (ppb)	50	18.4	102 b	107 b	70-130	5 b
Cadmium	ug/L (ppb)	5	<1	97	100	70-130	3
Chromium	ug/L (ppb)	20	<1	94	101	70-130	7
Copper	ug/L (ppb)	20	<5	91	97	70-130	6
Lead	ug/L (ppb)	10	<1	82	84	70-130	2
Mercury	ug/L (ppb)	5	<1	83	91	70-130	9
Nickel	ug/L (ppb)	20	2.02	93	99	70-130	6
Selenium	ug/L (ppb)	5	1.09	89 b	96 b	70-130	8 b
Silver	ug/L (ppb)	5	<1	89	91	70-130	2
Zinc	ug/L (ppb)	50	10.1	92 b	99 b	70-130	7 b

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	95	85-115
Barium	ug/L (ppb)	50	93	85-115
Cadmium	ug/L (ppb)	5	95	85-115
Chromium	ug/L (ppb)	20	99	85-115
Copper	ug/L (ppb)	20	100	85-115
Lead	ug/L (ppb)	10	101	85-115
Mercury	ug/L (ppb)	5	102	85-115
Nickel	ug/L (ppb)	20	100	85-115
Selenium	ug/L (ppb)	5	93	85-115
Silver	ug/L (ppb)	5	96	85-115
Zinc	ug/L (ppb)	50	93	85-115

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 05/04/23

Date Received: 04/26/23

Project: Stabbert Totes, F&BI 304362

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: 304314-06 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent	Acceptance Criteria
				Recovery MS	
Dichlorodifluoromethane	ug/L (ppb)	10	<1	99	27-164
Chloromethane	ug/L (ppb)	10	<10	89	34-141
Vinyl chloride	ug/L (ppb)	10	<0.02	105	16-176
Bromomethane	ug/L (ppb)	10	<5	107	10-193
Chloroethane	ug/L (ppb)	10	<1	120	50-150
Trichlorofluoromethane	ug/L (ppb)	10	<1	102	50-150
Acetone	ug/L (ppb)	50	<50	76	15-179
1,1-Dichloroethene	ug/L (ppb)	10	<1	103	50-150
Hexane	ug/L (ppb)	10	<5	82	49-161
Methylene chloride	ug/L (ppb)	10	<5	104	40-143
Methyl t-butyl ether (MTBE)	ug/L (ppb)	10	<1	102	50-150
trans-1,2-Dichloroethene	ug/L (ppb)	10	<1	103	50-150
1,1-Dichloroethane	ug/L (ppb)	10	<1	103	50-150
2,2-Dichloropropane	ug/L (ppb)	10	<1	118	62-152
cis-1,2-Dichloroethene	ug/L (ppb)	10	<1	102	50-150
Chloroform	ug/L (ppb)	10	<1	99	50-150
2-Butanone (MEK)	ug/L (ppb)	50	<20	109	34-168
1,2-Dichloroethane (EDC)	ug/L (ppb)	10	<0.2	105	50-150
1,1,1-Trichloroethane	ug/L (ppb)	10	<1	101	50-150
1,1-Dichloropropene	ug/L (ppb)	10	<1	98	50-150
Carbon tetrachloride	ug/L (ppb)	10	<0.5	97	50-150
Benzene	ug/L (ppb)	10	<0.35	101	50-150
Trichloroethene	ug/L (ppb)	10	<0.5	94	43-133
1,2-Dichloropropane	ug/L (ppb)	10	<1	105	50-150
Bromodichloromethane	ug/L (ppb)	10	<0.5	95	50-150
Dibromomethane	ug/L (ppb)	10	<1	105	50-150
4-Methyl-2-pentanone	ug/L (ppb)	50	<10	96	50-150
cis-1,3-Dichloropropene	ug/L (ppb)	10	<0.4	102	48-145
Toluene	ug/L (ppb)	10	<1	96	50-150
trans-1,3-Dichloropropene	ug/L (ppb)	10	<0.4	97	37-152
1,1,2-Trichloroethane	ug/L (ppb)	10	<0.5	104	50-150
2-Hexanone	ug/L (ppb)	50	<10	113	50-150
1,3-Dichloropropene	ug/L (ppb)	10	<1	102	50-150
Tetrachloroethene	ug/L (ppb)	10	<1	93	50-150
Dibromochloromethane	ug/L (ppb)	10	<0.5	97	33-164
1,2-Dibromoethane (EDB)	ug/L (ppb)	10	<1	98	50-150
Chlorobenzene	ug/L (ppb)	10	<1	95	50-150
Ethylbenzene	ug/L (ppb)	10	5.3	95 b	50-150
1,1,1,2-Tetrachloroethane	ug/L (ppb)	10	<1	98	50-150
m,p-Xylene	ug/L (ppb)	20	<2	93	50-150
o-Xylene	ug/L (ppb)	10	21	97 b	50-150
Styrene	ug/L (ppb)	10	<1	94	50-150
Isopropylbenzene	ug/L (ppb)	10	3.0	90 b	50-150
Bromoform	ug/L (ppb)	10	<5	96	23-161
n-Propylbenzene	ug/L (ppb)	10	6.6	94 b	50-150
Bromobenzene	ug/L (ppb)	10	<1	93	50-150
1,3,5-Trimethylbenzene	ug/L (ppb)	10	1.9	86	50-150
1,1,2,2-Tetrachloroethane	ug/L (ppb)	10	<0.2	116	57-162
1,2,3-Trichloropropane	ug/L (ppb)	10	<1	95	33-151
2-Chlorotoluene	ug/L (ppb)	10	<1	88	50-150
4-Chlorotoluene	ug/L (ppb)	10	<1	89	50-150
tert-Butylbenzene	ug/L (ppb)	10	<1	79	50-150
1,2,4-Trimethylbenzene	ug/L (ppb)	10	33	117 b	50-150
sec-Butylbenzene	ug/L (ppb)	10	1.6	78	46-139
p-Isopropyltoluene	ug/L (ppb)	10	<1	77	46-140
1,3-Dichlorobenzene	ug/L (ppb)	10	<1	85	50-150
1,4-Dichlorobenzene	ug/L (ppb)	10	<1	87	50-150
1,2-Dichlorobenzene	ug/L (ppb)	10	<1	87	50-150
1,2-Dibromo-3-chloropropane	ug/L (ppb)	10	<10	100	50-150
1,2,4-Trichlorobenzene	ug/L (ppb)	10	<1	80	50-150
Hexachlorobutadiene	ug/L (ppb)	10	<0.5	55	42-150
Naphthalene	ug/L (ppb)	10	11	110 b	50-150
1,2,3-Trichlorobenzene	ug/L (ppb)	10	<1	81	44-155

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 05/04/23

Date Received: 04/26/23

Project: Stabbert Totes, F&BI 304362

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	10	103	98	49-149	5
Chloromethane	ug/L (ppb)	10	87	90	34-143	3
Vinyl chloride	ug/L (ppb)	10	103	105	43-149	2
Bromomethane	ug/L (ppb)	10	108	118	28-182	9
Chloroethane	ug/L (ppb)	10	115	118	59-157	3
Trichlorofluoromethane	ug/L (ppb)	10	100	104	59-141	4
Acetone	ug/L (ppb)	50	81	78	20-139	4
1,1-Dichloroethene	ug/L (ppb)	10	104	106	67-138	2
Hexane	ug/L (ppb)	10	108	112	50-161	4
Methylene chloride	ug/L (ppb)	10	102	102	29-192	0
Methyl t-butyl ether (MTBE)	ug/L (ppb)	10	97	103	70-130	6
trans-1,2-Dichloroethene	ug/L (ppb)	10	100	105	70-130	5
1,1-Dichloroethane	ug/L (ppb)	10	99	104	70-130	5
2,2-Dichloropropane	ug/L (ppb)	10	108	112	71-148	4
cis-1,2-Dichloroethene	ug/L (ppb)	10	97	103	70-130	6
Chloroform	ug/L (ppb)	10	95	101	70-130	6
2-Butanone (MEK)	ug/L (ppb)	50	98	101	50-157	3
1,2-Dichloroethane (EDC)	ug/L (ppb)	10	99	105	70-130	6
1,1,1-Trichloroethane	ug/L (ppb)	10	100	106	70-130	6
1,1-Dichloropropene	ug/L (ppb)	10	98	107	70-130	9
Carbon tetrachloride	ug/L (ppb)	10	100	105	70-130	5
Benzene	ug/L (ppb)	10	95	102	70-130	7
Trichloroethene	ug/L (ppb)	10	92	99	70-130	7
1,2-Dichloropropane	ug/L (ppb)	10	102	104	70-130	2
Bromodichloromethane	ug/L (ppb)	10	88	93	70-130	6
Dibromomethane	ug/L (ppb)	10	94	104	70-130	10
4-Methyl-2-pentanone	ug/L (ppb)	50	96	105	70-130	9
cis-1,3-Dichloropropene	ug/L (ppb)	10	90	101	70-130	12
Toluene	ug/L (ppb)	10	99	99	70-130	0
trans-1,3-Dichloropropene	ug/L (ppb)	10	97	99	70-130	2
1,1,2-Trichloroethane	ug/L (ppb)	10	98	99	70-130	1
2-Hexanone	ug/L (ppb)	50	94	95	66-132	1
1,3-Dichloropropene	ug/L (ppb)	10	99	99	70-130	0
Tetrachloroethene	ug/L (ppb)	10	102	102	70-130	0
Dibromochloromethane	ug/L (ppb)	10	99	97	63-142	2
1,2-Dibromoethane (EDB)	ug/L (ppb)	10	96	96	70-130	0
Chlorobenzene	ug/L (ppb)	10	98	98	70-130	0
Ethylbenzene	ug/L (ppb)	10	100	101	70-130	1
1,1,1,2-Tetrachloroethane	ug/L (ppb)	10	103	103	70-130	0
m,p-Xylene	ug/L (ppb)	20	100	101	70-130	1
o-Xylene	ug/L (ppb)	10	105	106	70-130	1
Styrene	ug/L (ppb)	10	98	100	70-130	2
Isopropylbenzene	ug/L (ppb)	10	99	100	70-130	1
Bromoform	ug/L (ppb)	10	97	98	50-157	1
n-Propylbenzene	ug/L (ppb)	10	106	103	70-130	3
Bromobenzene	ug/L (ppb)	10	103	96	70-130	7
1,3,5-Trimethylbenzene	ug/L (ppb)	10	107	102	52-150	5
1,1,2,2-Tetrachloroethane	ug/L (ppb)	10	110	107	75-140	3
1,2,3-Trichloropropane	ug/L (ppb)	10	103	99	40-153	4
2-Chlorotoluene	ug/L (ppb)	10	105	101	70-130	4
4-Chlorotoluene	ug/L (ppb)	10	109	103	70-130	6
tert-Butylbenzene	ug/L (ppb)	10	103	99	70-130	4
1,2,4-Trimethylbenzene	ug/L (ppb)	10	104	100	70-130	4
sec-Butylbenzene	ug/L (ppb)	10	106	100	70-130	6
p-Isopropyltoluene	ug/L (ppb)	10	106	101	70-130	5
1,3-Dichlorobenzene	ug/L (ppb)	10	101	98	70-130	3
1,4-Dichlorobenzene	ug/L (ppb)	10	102	100	70-130	2
1,2-Dichlorobenzene	ug/L (ppb)	10	100	97	70-130	3
1,2-Dibromo-3-chloropropane	ug/L (ppb)	10	100	94	70-130	6
1,2,4-Trichlorobenzene	ug/L (ppb)	10	98	94	70-130	4
Hexachlorobutadiene	ug/L (ppb)	10	103	99	70-130	4
Naphthalene	ug/L (ppb)	10	100	96	61-133	4
1,2,3-Trichlorobenzene	ug/L (ppb)	10	98	94	69-143	4

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 05/04/23

Date Received: 04/26/23

Project: Stabbert Totes, F&BI 304362

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCS/D	Acceptance Criteria	RPD (Limit 20)
Phenol	ug/L (ppb)	5	31	28	10-86	10
Bis(2-chloroethyl) ether	ug/L (ppb)	5	75	73	54-111	3
2-Chlorophenol	ug/L (ppb)	5	69	65	10-97	6
1,3-Dichlorobenzene	ug/L (ppb)	5	64	62	48-96	3
1,4-Dichlorobenzene	ug/L (ppb)	5	65	64	48-96	2
1,2-Dichlorobenzene	ug/L (ppb)	5	67	65	52-96	3
Benzyl alcohol	ug/L (ppb)	25	68	65	10-76	5
2,2'-Oxybis(1-chloropropane)	ug/L (ppb)	5	70	74	59-101	6
2-Methylphenol	ug/L (ppb)	5	67	65	11-93	3
Hexachloroethane	ug/L (ppb)	5	63	60	47-97	5
N-Nitroso-di-n-propylamine	ug/L (ppb)	5	87	85	71-106	2
3-Methylphenol + 4-Methylphenol	ug/L (ppb)	5	64	60	10-66	6
Nitrobenzene	ug/L (ppb)	5	83	83	57-109	0
Isophorone	ug/L (ppb)	5	83	82	64-116	1
2-Nitrophenol	ug/L (ppb)	5	76	75	27-120	1
2,4-Dimethylphenol	ug/L (ppb)	5	68	74	10-106	8
Benzoic acid	ug/L (ppb)	40	23	20	10-102	14
Bis(2-chloroethoxy)methane	ug/L (ppb)	5	86	83	55-117	4
2,4-Dichlorophenol	ug/L (ppb)	5	83	81	23-116	2
1,2,4-Trichlorobenzene	ug/L (ppb)	5	71	73	56-98	3
Naphthalene	ug/L (ppb)	5	71	73	62-97	3
Hexachlorobutadiene	ug/L (ppb)	5	68	71	48-100	4
4-Chloroaniline	ug/L (ppb)	25	81	81	28-121	0
4-Chloro-3-methylphenol	ug/L (ppb)	5	86	83	18-113	4
2-Methylnaphthalene	ug/L (ppb)	5	76	76	64-101	0
1-Methylnaphthalene	ug/L (ppb)	5	78	77	64-103	1
Hexachlorocyclopentadiene	ug/L (ppb)	5	59	60	37-115	2
2,4,6-Trichlorophenol	ug/L (ppb)	5	85	83	16-131	2
2,4,5-Trichlorophenol	ug/L (ppb)	5	87	86	26-129	1
2-Chloronaphthalene	ug/L (ppb)	5	85	81	67-102	5
2-Nitroaniline	ug/L (ppb)	25	95	95	31-168	0
Dimethyl phthalate	ug/L (ppb)	5	101	105	70-130	4
Acenaphthylene	ug/L (ppb)	5	85	83	70-130	2
2,6-Dinitrotoluene	ug/L (ppb)	5	121	119	70-130	2
3-Nitroaniline	ug/L (ppb)	25	99	103	33-128	4
Acenaphthene	ug/L (ppb)	5	85	84	70-130	1
2,4-Dinitrophenol	ug/L (ppb)	10	114	108	10-137	5
Dibenzofuran	ug/L (ppb)	5	90	92	67-114	2
2,4-Dinitrotoluene	ug/L (ppb)	5	121	128	53-132	6
4-Nitrophenol	ug/L (ppb)	10	44	44	10-89	0
Diethyl phthalate	ug/L (ppb)	5	101	106	57-134	5
Fluorene	ug/L (ppb)	5	88	89	70-130	1
4-Chlorophenyl phenyl ether	ug/L (ppb)	5	93	92	70-130	1
N-Nitrosodiphenylamine	ug/L (ppb)	5	91	89	70-130	2
4-Nitroaniline	ug/L (ppb)	25	94	95	32-124	1
4,6-Dinitro-2-methylphenol	ug/L (ppb)	5	124	120	14-167	3
4-Bromophenyl phenyl ether	ug/L (ppb)	5	90	88	70-130	2
Hexachlorobenzene	ug/L (ppb)	5	76	75	58-111	1
Pentachlorophenol	ug/L (ppb)	5	88	87	10-144	1
Phenanthrene	ug/L (ppb)	5	95	92	70-130	3
Anthracene	ug/L (ppb)	5	89	91	70-130	2
Carbazole	ug/L (ppb)	5	91	94	70-130	3
Di-n-butyl phthalate	ug/L (ppb)	5	86	104	28-147	19
Fluoranthene	ug/L (ppb)	5	92	95	70-130	3
Pyrene	ug/L (ppb)	5	100	103	70-130	3
Benzyl butyl phthalate	ug/L (ppb)	5	93	95	34-142	2
Benz(a)anthracene	ug/L (ppb)	5	96	95	70-130	1
Chrysene	ug/L (ppb)	5	101	99	70-130	2
Bis(2-ethylhexyl) phthalate	ug/L (ppb)	5	93	90	44-140	3
Di-n-octyl phthalate	ug/L (ppb)	5	77	82	33-147	6
Benzo(a)pyrene	ug/L (ppb)	5	90	89	70-130	1
Benzo(b)fluoranthene	ug/L (ppb)	5	94	91	70-130	3
Benzo(k)fluoranthene	ug/L (ppb)	5	90	94	70-130	4
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	5	87	90	70-130	3
Dibenz(a,h)anthracene	ug/L (ppb)	5	85	89	70-130	5
Benzo(g,h,i)perylene	ug/L (ppb)	5	83	87	70-130	5

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria, biased high; or, the calibration results for the analyte were outside of acceptance criteria, biased high, with a detection for the analyte in the sample. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the standard reporting limit. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

k - The calibration results for the analyte were outside of acceptance criteria, biased high, and the analyte was not detected in the sample.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

P/C2

11

TURNAROUND TIME

Standard turnaround
ISH

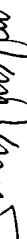
charges authorized by:

SAMPLE DISPOSAL
archive samples

her _____
Result: Dispose after 30

							ANALYSES REQUESTED								
Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars		NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082 SVOCS 8270E EPA 8270E	PRA 8 metals + Cu, Ni, Zn	Notes
Tote Comp 1	01 A-F	9/15/23	1130	w/hv	C	X	X			X			X	X	
Tote Comp 2	02 A-I	↓	1200	w/hv	F	X	X			X			X	X	
							Samples received at <u>4</u> °C								

Friedman & Bruya, Inc.
Ph. (206) 285-8282

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: 	Ben Carlsson	Stadium Group	4/25/23	1600
Received by:		RedEx		
Relinquished by:				
Received by: 	Phan Phan	FEBI	4/26/23	1330

Shipper No. 22623

Marine Vacuum Service Inc.

Date 6/01/23

Page 1 of 4

(SCAC)

FROM: CASH CALL
Shipper

TO: Consignee Marine Vacuum Service Inc.

Street 3022 OAKES AVE

Street 1516 South Graham Street

City ANACORTES State WA Zip Code _____

City Seattle State WA Zip Code 98108

24 hr. Emergency Contact Tel. No. ChemTel 1-800-255-3924
Contract MIS3627926

24 hr. Emergency Contact Tel. No. _____

Contract MIS3627926

Route

Vehicle Number 2129

No. of Units & Container Type	HM	BASIC DESCRIPTION UN or NA Number, Proper Shipping Name, Hazard Class, Packing Group	TOTAL QUANTITY (Weight, Volume, Gallons, etc.)	WEIGHT (Subject to Correction)	RATE	CHARGES (For Carrier Use Only)
1 TT	X	(DOT Spec Tank Required) UN1863 Fuel, Aviation, Turbin Engine, Class 3, PG I				
1 TT	X	(DOT Spec Tank Required) UN1203 Gasoline, Mixture Class 3, PG II				
1 TT	X	(DOT Spec Tank Required) UN1203 Gasoline, Class 3, PG II				
1 TT	X	NA1993 Diesel Mixture, Class 3, PG III				
1 TT	X	NA1993 Diesel, Class 3, PG III				
1 TT	X	NA1270 Petroleum Oil, Class 3, PG I				
1 TT	X	NA1270 Petroleum Oil, Mixture, Class 3, PG I				
1 TT		Oily Waste Water Non Reg by DOT	2,800 GAL			
1 TT		Waste Water Non Reg by DOT				
1 TT		Used Oil Non Reg by DOT				
1 TT		Used Coolant Non Reg by DOT				

PLACARDS TENDERED: YES ☐ NO ☒

Note — (1) Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property, as follows: "The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding _____ per _____."

(2) Where the applicable tariff provisions specify a limitation of the carrier's liability absent a release or a value declaration by the shipper and the shipper does not release the carrier's liability or declare a value, the carrier's liability shall be limited to the extent provided by such provisions. See NMFC Item 172.

(3) Commodities requiring special or additional care or attention in handling or stowing must be so marked and packaged as to ensure safe transportation. See Section 2(e) of Item 350, Bills of Lading, Freight Bills and Statements of Charges and Section 1(a) of the Contract Terms and Conditions for a list of such articles.

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name and are classified, packaged, marked and labelled/picarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Signature

REMIT
C.O.D. TO:
ADDRESS

COD

Amt: \$

C.O.D. FEE:
PREPAID ☐
COLLECT ☐

TOTAL CHARGES	\$
---------------	----

FREIGHT CHARGES
FREIGHT PREPAID ☐ Check box if charges are to be collected
 except when box is checked

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading, the property described above in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated above which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of it or any to said property over all or any portion of said route to de-

dition and as to each party at any time interested in all or any said property, that every service to be performed hereunder shall be subject to all the bill of lading terms and conditions in the governing classification or the date of shipment.

Shipper hereby certifies that he is familiar with all the trading terms and conditions in the governing classification and the sold terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

SHIPPER

CARRIER MR-VAC

PER *[Signature]*

PER Joe # *[Signature]*

DATE 06/01/20

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator ID Number WAR00002616		2. Page 1 of 1		3. Emergency Response Phone 503-224-3206		4. Manifest Tracking Number 017099652 FLE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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DESIGNATED FACILITY		8. Designated Facility Name and Site Address Chemical Waste Management of the NW 17629 Cedar Springs Lane Arlington, OR. 97812 Facility's Phone: 541-454-2643				U.S. EPA ID Number OR0089452353																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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Please print or type.

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number					
		WAR000003616	1	503-224-3206	017099846 FLE					
5. Generator's Name and Mailing Address		Generator's Site Address (if different than mailing address)								
Slabbert Maritime & Industrial 3022 Oakes Ave. Anacortes WA 98221		Alt. Scott Stalla								
Generator's Phone: 360 298-4435										
6. Transporter 1 Company Name		U.S. EPA ID Number								
WasteXpress		ORQ000023150								
7. Transporter 2 Company Name		U.S. EPA ID Number								
CHEMICAL WASTE MANAGEMENT of the N.W.		ORD089452353								
8. Designated Facility Name and Site Address		U.S. EPA ID Number								
CHEMICAL WASTE MANAGEMENT of the N.W. 17629 CEDAR SPRINGS LANE ARLINGTON OR 97812										
Facility's Phone: 541 454-2643		ORD089452353								
9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers		11. Total Quantity	12. Unit WL/Vol.	13. Waste Codes				
		No.	Type							
		X	1. UN1263, WASTE Paint related material 3, PGII, RQ(D001, ERG#128)	13	DM	6500	P	D001	D007	D008
			2.					D009	D018	D019
			3.							
	4.									
14. Special Handling Instructions and Additional Information										
Job # 112139										
15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.										
Generator's/Offoror's Printed/Typed Name			Signature			Month Day Year				
STAWN HIDA						12 4 3				
16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit: _____ Transporter signature (for exports only): _____ Date leaving U.S.: _____										
TRANSPORTER	17. Transporter Acknowledgment of Receipt of Materials									
	Transporter 1 Printed/Typed Name			Signature			Month Day Year			
	KONRAD WEIS						12 4 23			
	Transporter 2 Printed/Typed Name			Signature			Month Day Year			
	g. J. R.						12 4 23			
DESIGNATED FACILITY	18. Discrepancy									
	18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection									
	Manifest Reference Number:									
	18b. Alternate Facility (or Generator) U.S. EPA ID Number									
	Facility's Phone:									
	18c. Signature of Alternate Facility (or Generator)						Month Day Year			
	19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)									
	1.		2.		3.		4.			
	20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a									
	Printed/Typed Name			Signature			Month Day Year			

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator ID Number	2. Page 1 of 2	3. Emergency Response Phone	4. Manifest Tracking Number		
		WAR000003610	245	503-224-3200	017099847 FLE		
5. Generator's Name and Mailing Address		Generator's Site Address (if different than mailing address)					
Stabbert Maritime & Industrial 3022 Oakes Ave. Anacortes WA 98221		Alt Scott St					
Generator's Phone: 360 298-4435							
6. Transporter 1 Company Name		U.S. EPA ID Number					
WasteXpress		ORQ000023150					
7. Transporter 2 Company Name		U.S. EPA ID Number					
CHEMICAL WASTE MANAGEMENT of the N.W.		ORD089452353					
8. Designated Facility Name and Site Address		U.S. EPA ID Number					
CHEMICAL WASTE MANAGEMENT of the N.W. 17629 CEDAR SPRINGS LANE ARLINGTON OR 97812		ORD089452353					
Facility's Phone: 541 454-2643							
9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers		11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes	
		No.	Type				
X	1. UN3082, WASTE Environmentally hazardous substance, liquid, n.o.s. (Creosote), 9, PGIII.	3	DM	500	P	D018 D019 D021 D035 D037 D039	
X	2. UN3082, WASTE Environmentally hazardous substance, liquid, n.o.s. (Creosote), 9, PGIII.	1	DM	150	P	D018 D019 D021 D035 D037 D039	
X	3. UN3082, WASTE Environmentally hazardous substance, liquid, n.o.s. (Creosote), 9, PGIII.	1	DF	275	P	D018 D019 D021 D035 D037 D039	
	4.						
14. Special Handling Instructions and Additional Information							
3) 02357413 1/95 Job# 112139 2) 02357413 1/85 & 1/85							
15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.							
Generator's/Offor's Printed/Typed Name		Signature		Month	Day	Year	
SHAWN HIPAY				12	4	23	
16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit: _____ Transporter signature (for exports only): _____ Date leaving U.S.: _____							
17. Transporter Acknowledgment of Receipt of Materials							
Transporter 1 Printed/Typed Name		Signature		Month	Day	Year	
RONALD WEIS				12	4	23	
Transporter 2 Printed/Typed Name		Signature		Month	Day	Year	
g/p				12	5	23	
18. Discrepancy							
18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection							
Manifest Reference Number: _____							
18b. Alternate Facility (or Generator) U.S. EPA ID Number _____							
Facility's Phone: _____							
18c. Signature of Alternate Facility (or Generator) Month Day Year _____							
19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)							
1. _____ 2. _____ 3. _____ 4. _____							
20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a							
Printed/Typed Name		Signature		Month	Day	Year	

GENERATOR

INT'L

TRANSPORTER

DESIGNATED FACILITY

NON-HAZARDOUS
WASTE MANIFEST1. Generator ID Number
S Q G2. Page 1 of
13. Emergency Response Phone
503-224-3206

4. Waste Tracking Number

112696

5. Generator's Name and Mailing Address
Stabbert Maritime & Industrial
3100 Oakes Ave.
Anacortes WA 98221

Att: Scott Stalia Generator's Site Address (if different than mailing address)

Generator's Phone: 360 298-4435

6. Transporter 1 Company Name
WasteXpressU.S. EPA ID Number
ORQ000023150

7. Transporter 2 Company Name

U.S. EPA ID Number

8. Designated Facility Name and Site Address
WasteXpress
11615 N Lombard St.
Portland OR 97203

U.S. EPA ID Number

Facility's Phone: 503 224-3206

ORQ000023150

9. Waste Shipping Name and Description

10. Containers

No.

Type

11. Total
Quantity12. Unit
Wt./Vol.

NONE

1. Non-regulated material, Solids, (Spag Sorb, Pads, Sock Booms)
(Used oily Rags + oily water)

1

DM

75

P

2. Non-regulated material, Solids, (Used Oil Rags)

8

DM

1200

P

NONE

3. Non-Regulated Material, Solids (Used oil
filters)

2

DM

350

P

4. Non-Regulated Material, Solids, (Used
oily Rags + oil filters)

2

DM

400

P

13. Special Handling Instructions and Additional Information

1) ~~FF01~~ STAB01 1/55

3) RECOBB 2/55

2) LF01 8/55

4) RECOBB 2/55

14. GENERATOR'S CERTIFICATION: I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Generator's/Officer's Printed/Typed Name

Signature

Month Day Year

15. International Shipments

☐

Import to U.S.

☐

Export from U.S.

Port of entry/exit:

Transporter Signature (for exports only):

Date leaving U.S.:

16. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name

Signature

Month Day Year

KOLUWO WEIS

Ronald Weiss

3 20 24

Transporter 2 Printed/Typed Name

Signature

Month Day Year

17. Discrepancy

17a. Discrepancy Indication Space

☐

Quantity

☐

Type

☐

Residue

☐

Partial Rejection

☐

Full Rejection

Manifest Reference Number:

17b. Alternate Facility (or Generator)

U.S. EPA ID Number

Facility's Phone:

17c. Signature of Alternate Facility (or Generator)

Month Day Year

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a

Printed/Typed Name

Signature

Month Day Year

John McCarty

[Signature]

3 28 24

DESIGNATED FACILITY TO GENERATOR

Site Photos of Bilge Water Totes



Nine totes of oily bilge water stored along the east side of the west warehouse.

Site Photos of Hazardous Waste Identified For Disposal



View towards the base of the main driveway where the semi-trailer of hazardous waste had been stored (July 2, 2021)



Hundreds of containers of hazardous waste stored inside the trailer as of April 24, 2023.



Semi-trailer of hazardous waste after it was moved alongside the west warehouse (12/5/2023).



Small amount of residual hazardous waste inside the trailer as of December 5, 2023.



Containers of hazardous waste stored inside the west warehouse awaiting collection for disposal after being characterized and sorted (12/5/2023).

APPENDIX VI

Inadvertent Discovery Plan (IDP)

Health and Safety Plan (HASP)

Sampling & Analysis Plan and Quality Assurance Project Plan (SAP/QAPP)



INADVERTENT DISCOVERY PLAN

PLAN AND PROCEDURES FOR THE DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS

To request ADA accommodation, including materials in a format for the visually impaired, call Ecology at 360-407-6000 or visit <https://ecology.wa.gov/accessibility>. People with impaired hearing may call Washington Relay Service at 711. People with a speech disability may call TTY at 877-833-6341.

Site Name(s): Location:

Project Lead/Organization: County:

If this Inadvertent Discovery Plan (IDP) is for multiple (batched) projects, ensure the location information covers all project areas.

1. INTRODUCTION

The IDP outlines procedures to perform in the event of a discovery of archaeological materials or human remains, in accordance with applicable state and federal laws. An IDP is required, as part of Agency Terms and Conditions for all grants and loans, for any project that creates disturbance above or below the ground. An IDP is not a substitute for a formal cultural resource review (Executive 21-02 or Section 106).

Once completed, **the IDP should always be kept at the project site** during all project activities. All staff, contractors, and volunteers should be familiar with its contents and know where to find it.

2. CULTURAL RESOURCE DISCOVERIES

A cultural resource discovery could be prehistoric or historic. Examples include (see images for further examples):

- An accumulation of shell, burned rocks, or other food related materials.
- Bones, intact or in small pieces.
- An area of charcoal or very dark stained soil with artifacts.
- Stone tools or waste flakes (for example, an arrowhead or stone chips).
- Modified or stripped trees, often cedar or aspen, or other modified natural features, such as rock drawings.
- Agricultural or logging materials that appear older than 50 years. These could include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, and many other items.
- Clusters of tin cans or bottles, or other debris that appear older than 50 years.
- Old munitions casings. ***Always assume these are live and never touch or move.***
- Buried railroad tracks, decking, foundations, or other industrial materials.
- Remnants of homesteading. These could include bricks, nails, household items, toys, food containers, and other items associated with homes or farming sites.

The above list does not cover every possible cultural resource. When in doubt, assume the material is a cultural resource.

3. ON-SITE RESPONSIBILITIES

If any employee, contractor, or subcontractor believes that they have uncovered cultural resources or human remains at any point in the project, take the following steps to ***Stop-Protect-Notify***. If you suspect that the discovery includes human remains, also follow Sections 5 and 6.

STEP A: Stop Work.

All work must stop immediately in the vicinity of the discovery.

STEP B: Protect the Discovery.

Leave the discovery and the surrounding area untouched and create a clear, identifiable, and wide boundary (30 feet or larger) with temporary fencing, flagging, stakes, or other clear markings. Provide protection and ensure integrity of the discovery until cleared by the Department of Archaeological and Historical Preservation (DAHP) or a licensed, professional archaeologist.

Do not permit vehicles, equipment, or unauthorized personnel to traverse the discovery site. Do not allow work to resume within the boundary until the requirements of this IDP are met.

STEP C: Notify Project Archaeologist (if applicable).

If the project has an archaeologist, notify that person. If there is a monitoring plan in place, the archaeologist will follow the outlined procedure.

STEP D: Notify Project and Washington Department of Ecology (Ecology) contacts.

Project Lead Contacts

Primary Contact

Name: Ben Carlson
Organization: Stratum Group
Phone: 978-857-0728
Email: ben@stratumgroup.net

Alternate Contact

Name: Kelly Allison
Organization: Stabbert Maritime & Industr
Phone: 425-736-9819
Email: kellya@stabbertmaritime.com

Ecology Contacts (completed by Ecology Project Manager)

Ecology Project Manager

Name: David Horne
Program: Site Manager & Baywide Coordinator
Phone: (360) 742-1091
Email: hoda461@ECY.WA.GOV

Alternate or Cultural Resource Contact

Name: Guy Tasa
Program: State Physical Anthropologist
Phone: (360) 790-1633
Email: Guy.tasa@dahp.wa.gov

STEP E: Ecology will notify DAHP.

Once notified, the Ecology Cultural Resource Contact or the Ecology Project Manager will contact DAHP to report and confirm the discovery. To avoid delay, the Project Lead/Organization will contact DAHP if they are not able to reach Ecology.

DAHP will provide the steps to assist with identification. DAHP, Ecology, and Tribal representatives may coordinate a site visit following any necessary safety protocols. DAHP may also inform the Project Lead/Organization and Ecology of additional steps to further protect the site.

Do not continue work until DAHP has issued an approval for work to proceed in the area of, or near, the discovery.

DAHP Contacts:

Name: Rob Whitlam, PhD
Title: State Archaeologist
Cell: 360-890-2615
Email: Rob.Whitlam@dahp.wa.gov
Main Office: 360-586-3065

Human Remains/Bones:

Name: Guy Tasa, PhD
Title: State Anthropologist
Cell: 360-790-1633 (24/7)
Email: Guy.Tasa@dahp.wa.gov

4. TRIBAL CONTACTS

In the event cultural resources are discovered, the following tribes will be contacted. See Section 10 for Additional Resources.

Tribe:	Samish Indian Nation	Tribe:	Upper Skagit Indian Tribe
Name:	Jackie Ferry	Name:	Scott Schuyler
Title:	Tribal Historic Preservation Officer	Title:	Cultural Resources
Phone:	360-293-6404 x126	Phone:	360-854-7009
Email:	jferry@samishtribe.nsn.us	Email:	sschuyler@upperskagit.com
Tribe:	Tulalip Tribes of Washington	Tribe:	Swinomish Indian Tribal Community
Name:	Richard Young	Name:	Josephine Jefferson
Title:	Cultural Resources	Title:	Tribal Historic Preservation Officer
Phone:	360-716-2652	Phone:	(360) 466-7352
Email:	ryoung@tulaliptribes-nsn.gov	Email:	jjefferson@swinomish.nsn.us

Please provide contact information for additional tribes within your project area, if needed, in Section 11.

5. FURTHER CONTACTS (if applicable)

If the discovery is confirmed by DAHP as a cultural or archaeological resource, or as human remains, and there is a partnering federal or state agency, Ecology or the Project Lead/Organization will ensure the partnering agency is immediately notified.

Federal Agency:

Agency:	
Name:	
Title:	
Phone:	
Email:	

State Agency:

Agency:	
Name:	
Title:	
Phone:	
Email:	

6. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL MATERIAL

Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect. Follow the steps under ***Stop-Protect-Notify***. For specific instructions on how to handle a human remains discovery, see: [RCW 68.50.645: Skeletal human remains—Duty to notify—Ground disturbing activities—Coroner determination—Definitions.](#)

Suggestion: If you are unsure whether the discovery is human bone or not, contact Guy Tasa with DAHP, for identification and next steps. Do not pick up the discovery.

Guy Tasa, PhD State Physical Anthropologist

Guy.Tasa@dahp.wa.gov

(360) 790-1633 (Cell/Office)

For discoveries that are confirmed or suspected human remains, follow these steps:

1. Notify law enforcement and the Medical Examiner/Coroner using the contacts below. **Do not call 911** unless it is the only number available to you.

Enter contact information below (required):

- Local Medical Examiner or Coroner name and phone:

Hayley Thompson: 360-416-1996

- Local Law Enforcement main name and phone:

Skagit County Sheriff - 911

- Local Non-Emergency phone number (911 if without a non-emergency number):

360-416-1911

2. The Medical Examiner/Coroner (with assistance of law enforcement personnel) will determine if the remains are human or if the discovery site constitutes a crime scene and will notify DAHP.
3. **DO NOT speak with the media, allow photography or disturbance of the remains, or release any information about the discovery on social media.**
4. If the remains are determined to be non-forensic, Cover the remains with a tarp or other materials (not soil or rocks) for temporary protection and to shield them from being photographed by others or disturbed.

Further activities:

- Per [RCW 27.44.055](#), [RCW 68.50](#), and [RCW 68.60](#), DAHP will have jurisdiction over non-forensic human remains. Ecology staff will participate in consultation. Organizations may also participate in consultation.
- Documentation of human skeletal remains and funerary objects will be agreed upon through the consultation process described in [RCW 27.44.055](#), [RCW 68.50](#), and [RCW 68.60](#).
- When consultation and documentation activities are complete, work in the discovery area may resume as described in Section 8.

If the project occurs on federal lands (such as a national forest or park or a military reservation) the provisions of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) apply and the responsible federal agency will follow its provisions. Note that state highways that cross federal lands are on an easement and are not owned by the state.

If the project occurs on non-federal lands, the Project Lead/Organization will comply with applicable state and federal laws, and the above protocol.

7. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

Archaeological resources discovered during construction are protected by state law [RCW 27.53](#) and assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The Project Lead/Organization must ensure that proper documentation and field assessment are made of all discovered cultural resources in cooperation with all parties: the federal agencies (if any), DAHP, Ecology, affected tribes, and the archaeologist.

The archaeologist will record all prehistoric and historic cultural material discovered during project construction on a standard DAHP archaeological site or isolate inventory form. They will photograph site overviews, features, and artifacts and prepare stratigraphic profiles and soil/sediment descriptions for minimal subsurface exposures. They will document discovery locations on scaled site plans and site location maps.

Cultural features, horizons, and artifacts detected in buried sediments may require the archaeologist to conduct further evaluation using hand-dug test units. They will excavate units in a controlled fashion to expose features, collect samples from undisturbed contexts, or to interpret complex stratigraphy. They may also use a test unit or trench excavation to determine if an intact occupation surface is present. They will only use test units when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. They will conduct excavations using standard archaeological techniques to precisely document the location of cultural deposits, artifacts, and features.

The archaeologist will record spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock for each unit on a standard form. They will complete test excavation unit level forms, which will include plan maps for each excavation level and artifact counts and material types, number, and vertical provenience (depth below

surface and stratum association where applicable) for all recovered artifacts. They will draw a stratigraphic profile for at least one wall of each test excavation unit.

The archaeologist will screen sediments excavated for purposes of cultural resources investigation through 1/8-inch mesh, unless soil conditions warrant 1/4-inch mesh.

The archaeologist will analyze, catalogue, and temporarily curate all prehistoric and historic artifacts collected from the surface and from probes and excavation units. The ultimate disposition of cultural materials will be determined in consultation with the federal agencies (if any), DAHP, Ecology, and the affected tribe(s).

Within 90 days of concluding fieldwork, the archaeologist will provide a technical report describing any and all monitoring and resultant archaeological excavations to the Project Lead/Organization, who will forward the report to Ecology, the federal agencies (if any), DAHP, and the affected tribe(s) for review and comment.

If assessment activities expose human remains (burials, isolated teeth, or bones), the archaeologist and Project Lead/Organization will follow the process described in **Section 6**.

8. PROCEEDING WITH WORK

The Project Lead/Organization shall work with the archaeologist, DAHP, and affected tribe(s) to determine the appropriate discovery boundary and where work can continue.

Work may continue at the discovery location only after the process outlined in this plan is followed and the Project Lead/Organization, DAHP, any affected tribe(s), Ecology, and the federal agencies (if any) determine that compliance with state and federal laws is complete.

9. ORGANIZATION RESPONSIBILITY

The Project Lead/Organization is responsible for ensuring:

- This IDP has complete and accurate information.
- This IDP is immediately available to all field staff at the sites and available by request to any party.
- This IDP is implemented to address any discovery at the site.
- That all field staff, contractors, and volunteers are instructed on how to implement this IDP.

10. ADDITIONAL RESOURCES

Informative Video

Ecology recommends that all project staff, contractors, and volunteers view this informative video explaining the value of IDP protocol and what to do in the event of a discovery. The target audience is anyone working on the project who could unexpectedly find cultural resources or human remains while excavating or digging. The video is also posted on DAHP's inadvertent discovery language website.

[Ecology's IDP Video](https://www.youtube.com/watch?v=ioX-4cXfbDY) (<https://www.youtube.com/watch?v=ioX-4cXfbDY>)

Informational Resources

[DAHP](https://dahp.wa.gov) (<https://dahp.wa.gov>)

[Washington State Archeology \(DAHP 2003\)](https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf)

(https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf)

[Association of Washington Archaeologists](https://www.archaeologyinwashington.com) (<https://www.archaeologyinwashington.com>)

Potentially Interested Tribes

[Interactive Map of Tribes by Area](https://dahp.wa.gov/archaeology/tribal-consultation-information)

(<https://dahp.wa.gov/archaeology/tribal-consultation-information>)

[WSDOT Tribal Contact Website](https://wsdot.wa.gov/tribal/TribalContacts.htm)

(<https://wsdot.wa.gov/tribal/TribalContacts.htm>)

11. ADDITIONAL INFORMATION

Please add any additional contact information or other information needed within this IDP.

Snoqualmie Indian Tribe
Steven Moses
Director of Archaeology & Historic Preservation
(425) 495-6097
steve@snoqualmietribe.us

Sauk-Suiattle Indian Tribe
Kevin Joseph
Tribal Historic Preservation Officer
(360) 436-0333
kJoseph@sauk-suiattle.com

Lummi Nation
Lena Tso
Tribal Historic Preservation Officer
(360) 312-2257
lenat@lummi-nsn.gov

Confederated Tribes of the Colville Reservation
Guy Moura

Implement the IDP if you see...

Chipped stone artifacts.

Examples are:

- Glass-like material.
- Angular material.
- “Unusual” material or shape for the area.
- Regularity of flaking.
- Variability of size.



Stone artifacts from Oregon.



Stone artifacts from Washington.



Biface-knife, scraper, or pre-form found in NE Washington. Thought to be a well knapped object of great antiquity. Courtesy of Methow Salmon Rec. Foundation.

Implement the IDP if you see...

Ground stone artifacts.

Examples are:

- Unusual or unnatural shapes or unusual stone.
- Striations or scratching.
- Etching, perforations, or pecking.
- Regularity in modifications.
- Variability of size, function, or complexity.



Above: Fishing Weight - credit [CRITFC Treaty Fishing Rights website](#).



Artifacts from unknown locations (left and right images).



Implement the IDP if you see...

Bone or shell artifacts, tools, or beads.

Examples are:

- Smooth or carved materials.
- Unusual shape.
- Pointed as if used as a tool.
- Wedge shaped like a “shoehorn”.
- Variability of size.
- Beads from shell (*dentalium*) or tusk.



Upper Left: Bone Awls from Oregon.

Upper Center: Bone Wedge from California.

Upper Right: Plateau dentalium choker and bracelet, from [Nez Perce National Historical Park](#), 19th century, made using [Antalis pretiosa](#) shells Credit: Nez Perce - Nez Perce National Historical Park, NEPE 8762, [Public Domain](#).

Above: Tooth Pendants. Right: Bone Pendants. Both from Oregon and Washington.



Implement the IDP if you see...

Culturally modified trees, fiber, or wood artifacts.

Examples are:

- Trees with bark stripped or peeled, carvings, axe cuts, de-limbing, wood removal, and other human modifications.
- Fiber or wood artifacts in a wet environment.
- Variability of size, function, and complexity.



Left and Below: *Culturally modified tree and an old carving on an aspen (Courtesy of DAHP).*

Right, Top to Bottom: *Artifacts from Mud Bay, Olympia: Toy war club, two strand cedar rope, wet basketry.*



Implement the IDP if you see...

Strange, different, or interesting looking dirt, rocks, or shells.

Human activities leave traces in the ground that may or may not have artifacts associated with them. Examples are:

- “Unusual” accumulations of rock (especially fire-cracked rock).
- “Unusual” shaped accumulations of rock (such as a shape similar to a fire ring).
- Charcoal or charcoal-stained soils, burnt-looking soils, or soil that has a “layer cake” appearance.
- Accumulations of shell, bones, or artifacts. Shells may be crushed.
- Look for the “unusual” or out of place (for example, rock piles in areas with otherwise few rocks).



Shell Midden pocket in modern fill discovered in sewer trench.



Underground oven. Courtesy of DAHP.

Shell midden with fire cracked rock.



Hearth excavated near Hamilton, WA.

Implement the IDP if you see...

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Agricultural or logging equipment. May include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, etc.
- Domestic items including square or wire nails, amethyst colored glass, or painted stoneware.



Left: Top to Bottom: *Willow pattern serving bowl and slip joint pocket knife discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*



Right: *Collections of historic artifacts discovered during excavations in eastern Washington cities.*



Implement the IDP if you see...

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Railway tokens, coins, and buttons.
- Spectacles, toys, clothing, and personal items.
- Items helping to understand a culture or identity.
- Food containers and dishware.



Main Image: *Dishes, bottles, workboot found at the North Shore Japanese bath house (ofuro) site, Courtesy Bob Muckle, Archaeologist, Capilano University, B.C. This is an example of an above ground resource.*



Right, from Top to Bottom:
Coins, token, spectacles and Montgomery Ward pitchfork toy discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.



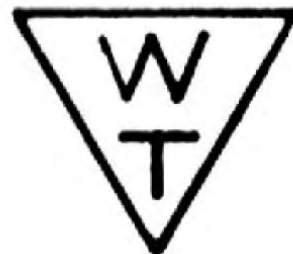
Implement the IDP if you see...

- Old munition casings – if you see ammunition of any type – ***always assume they are live and never touch or move!***
- Tin cans or glass bottles with an older manufacturer's technique – maker's mark, distinct colors such as turquoise, or an older method of opening the container.



Far Left: .303 British cartridge found by a WCC planting crew on Skagit River. Don't ever touch something like this!
Left: Maker's mark on bottom of old bottle.

Right: Old beer can found in Oregon. ACME was owned by Olympia Brewery. Courtesy of Heather Simmons.



Logo employed by Whithall Tatum & Co. between 1924 to 1938 (Lockhart et al. 2016).



Can opening dates, courtesy of W.M. Schroeder.

Implement the IDP if you see...

You see historic foundations or buried structures.

Examples are:

- Foundations.
- Railroad and trolley tracks.
- Remnants of structures.



Counter Clockwise, Left to Right: *Historic structure 45KI924, in WSDOT right of way for SR99 tunnel. Remnants of Smith Cove shantytown (45-KI-1200) discovered during Ecology CSO excavation, City of Spokane historic trolley tracks uncovered during stormwater project, intact foundation of historic home that survived the Great Ellensburg Fire of July 4, 1889, uncovered beneath parking lot in Ellensburg.*

Implement the IDP if you see...

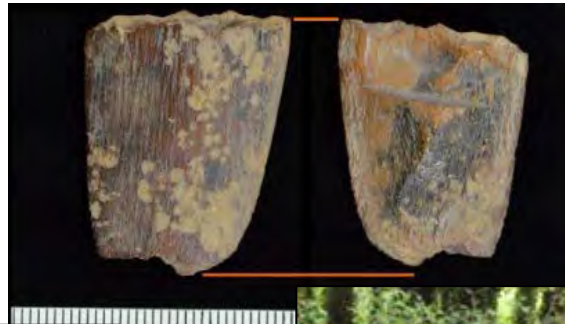
Potential human remains.

Examples are:

- Grave headstones that appear to be older than 50 years.
- Bones or bone tools--intact or in small pieces. It can be difficult to differentiate animal from human so they must be identified by an expert.
- These are all examples of animal bones and are not human.

Center: *Bone wedge tool, courtesy of Smith Cove Shantytown excavation (45K11200).*

Other images (Top Right, Bottom Left, and Bottom) Center: Courtesy of DAHP.



Directly Above: This is a real discovery at an Ecology sewer project site.

What would you do if you found these items at a site? Who would be the first person you would call?

Hint: Read the plan!



HEALTH & SAFETY PLAN

Lovric's Sea-Craft
3100 Oakes Avenue
Anacortes, Washington 98221
Facility Site ID #21847524

Prepared For:

Guemes Channel Holdings, LLC

By:



PO Box 2546
Bellingham, WA 98227
(360) 714-9409

January 15, 2025

**ALL PERSONNEL HAVE BEEN BRIEFED AND/OR
HAVE READ THE ABOVE PLAN AND ARE FAMILIAR WITH ITS PROVISIONS**

Name

Company

Signature

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APPENDICES

APPENDIX I

Figure 1 – Site Vicinity Map

Figure 2 – Annotated Aerial Photograph with Key Site Features

Map & Directions to Nearest Hospital

APPENDIX II

Chemical Information Sheets

1.0 INTRODUCTION

This health and safety plan (HASP) was developed specifically for the proposed Remedial Investigation (RI) at the Lovric's Sea Craft site (Site) in Anacortes, Washington.

Every employee's personal health and safety is Stratum Group's foremost concern when conducting official company business and work-related activities. Your personal health and safety should be your primary consideration before and while performing any work. You should neither take nor allow anyone else to take any action that you believe jeopardizes your health or safety, or violates any federal, state, or local health or safety regulations. Stratum Group expects its employees to follow the policies and procedures set forth in this HASP. Employees at all level of our organization are covered by this requirement. Changes in this program will only be made with the prior approval of the Project Manager (PM).

The goal on this project, as on all Stratum Group projects, is to experience zero injuries and to remain in compliance with applicable federal, state, and local health and safety requirements. The PM is accountable for employee safety and health on this project. The names and contact numbers for key personnel for this project are provided in Section 2 of this document.

The Department of Labor has published final rules (Part 1910.120 of Title 29 of the Code of Federal Regulations, March 6, 1990) that amend the existing Occupational Safety and Health Administration (OSHA) standards for hazardous waste operations and emergency response. Within the State of Washington, these requirements are addressed in Chapter 296-843 of the Washington Administrative Code, Hazardous Waste Operations. These regulations apply to the activities to be performed at this Site as a site remediation, or cleanup, under the Federal Resource Conservation and Recovery Act of 1976 and/or the Washington State Model Toxics Control Act (MTCA).

Subcontractors to Stratum Group are required to prepare and effectively implement their own HASP based on their unique scope of work and professional expertise. Each subcontractor's HASP must comply with all applicable federal, state, and local regulations. The subcontractor's HASP should employ appropriate best practices to protect all personnel working on the Site, as well as the public, and to prevent negative impacts to the project or site.

A copy of this HASP will be maintained on site during all field activities for this project.



2.0 EMERGENCY CONTACT INFORMATION

For a critical emergency, 911 should be called immediately. An emergency is when an urgent need for assistance or relief is needed with respect to human health.

Contact information for Stratum Group personnel involved in this project is provided below.

Stratum Group Contact Information

Title	Name	Phone	Email
Project Manager	Ben Carlson	978-857-0728	ben@stratumgroup.net
Asst. Project Manager	Kim Ninnemann	360-920-0468	kim@stratumgroup.net
Field Scientist	Kristin Wilmes	360-915-4063	kristin@stratumgroup.net

Contact information for Stabbert Maritime personnel on site in the event of a health and safety concern is provided below.

Stabbert Maritime Contact Information

Title	Name	Phone	Email
Chief Financial Officer – Stabbert Project Manager	Kelly Allison	425-736-9819	kellya@stabbertmaritime.com
Facilities Manager	Scott Statia	360-298-4435	scotts@stabbertmaritime.com
Stabbert Safety Officer	David Summerland	206-900-2032	davids@stabbertmaritime.com

Contact information for other individuals or entities involved in the planned work is provided below.

Remedial Investigation Subcontractor Contact Information

Role	Name	Address	Phone
Driller	Holocene Drilling	11412 62 nd Ave E, Puyallup, WA	253-848-6500
Private Utility Locate	CNI Locates	450 Alaskan Way, Suite 200, Seattle, WA	253-826-1177

Contact information for local and national emergency services providers is provided below. Directions to the nearest hospital from the work site are provided in Appendix I.



Emergency Service Contact Information

Service	Name	Address	Phone
Hospital	Island Health	1211 24 th Street, Anacortes, WA	360-299-1300
Police	Anacortes Police Department	1218 24 th Street, Anacortes, WA	911 or 360-293-4684
Fire	Anacortes Fire Department	1016 13 th Street, Anacortes, WA	911 or 360-293-1925
Public Works	City of Anacortes Public Works	904 6 th Street, Anacortes, WA	360-293-1921
Poison Control	Washington Poison Center	--	800-222-1222
National Response Center		--	800-422-8802
U.S. Coast Guard		--	206-217-6001

3.0 SITE DESCRIPTION

3.1 Site Location & Description

The Site is located within the city limits of Anacortes, Washington in Skagit County. The Site is located on the north shore of Fidalgo Island approximately 1.4 miles west-southwest of downtown Anacortes. The primary street address for the Site is 3100 Oakes Avenue, but the properties that compose the site are also recognized under the addresses 3006 Oakes Avenue, 3022 Oakes Avenue, and 1100 Dakota Avenue. The location of the Site is presented in Figure 1 in Appendix I.

The Property on which the Site is located covers approximately 8.7 acres, portions of which are submerged below the high-water mark of Guemes Channel. The upland consists of a steep vegetated hillside and a relatively level shoreline commercial area that is developed with multiple buildings and marine railways. The elevation of the Property along Oakes Avenue is approximately 70 feet above mean sea level, with a steep 50-to-60-foot elevation drop to the nearshore and shoreline areas where the shipyard infrastructure development is present.

A variety of structures are located on the Site which were constructed over a period of time by prior owners to facilitate site uses including fish processing, a shipyard, and a marina. An annotated aerial photograph of the Property with key site features labeled is provided in Figure 2 in Appendix I.

3.2 Development and Use History

The Property has been developed since at least the late 1890s, when the Russian Cement plant was constructed. The business produced glue, fertilizer, and fish oil from fish waste gathered



from nearby canneries. Robinson Fisheries established a cod cannery on the west side of the Property circa 1912. The entire Property is believed to have operated as a fish processing facility through the mid-1960s.

Lovric's Sea-Craft shipyard was established on the Property by 1965. Shipyard activities are apparent on the Property through aerial photograph review by 1969. Significant filling of the waterfront areas of the Property occurred in the late 1970s and 1980s to create many of the existing flat areas surrounding the two main warehouses. The fill reportedly consists of a mix of marine dredge spoils and upland-derived fill. The Property has been in continuous operation as a shipyard since the mid-1960s, with activities including engine repair and maintenance, welding, painting, sandblasting, replacement of sacrificial anodes, boat upfitting, hull cleaning and painting, and general boat maintenance services.

4.0 POTENTIAL SITE HAZARDS & HAZARD MANAGEMENT

Environmental investigation and sampling activities are described in detail in the Site's Remedial Investigation Work Plan. The work plan has been designed to investigate and define potential contamination of site soil and groundwater from potentially hazardous substances previously and currently used on site. Planned activities including utilizing drilling equipment and hand tools to collect soil and groundwater samples across the site's upland. Health and safety hazards that may be encountered on site include chemical hazards associated with potential site contaminants, physical hazards associated with shipyard activities on the Site and RI field activities, and natural biological and weather hazards that may be encountered.

4.1 Required Personal Protective Equipment (PPE)

Based on the concentrations of chemicals observed during previous investigations, environmental sampling activities should proceed in LEVEL D PPE consisting of:

- Hard Hat
- Reflective safety vest or jacket
- Noise protection while drilling
- Work boots with safety toe (steel or composite)
- Nitrile Gloves
- Safety Eye Wear (ANSI Z-87 approved)
- If an employee or subcontractor wishes, their work uniform may include a Tychem 9400 Chemically protective suits.

If site conditions are different than those anticipated such that Level C or greater PPE is required (e.g., large volumes of free chemical products are encountered, consistently elevated vapor concentrations are detected by the PID), site work will cease until conditions are suitable to restart work under Level D PPE.



Personnel must remain aware that the use of personal protective equipment (PPE) may reduce an individual's dexterity and visibility and performing some tasks may be more difficult.

4.2 Chemical Hazards

Soil, sediment, surface water, and groundwater at the Site may be contaminated with various chemical contaminants, some of which may be carcinogenic. Drilling personnel will remain alert to staining of drill tools and chemical odors or other signs of subsurface encounters with potentially hazardous materials.

Potential contaminants of concern (COCs) on the Site include petroleum hydrocarbons, volatile and semi-volatile organic compounds (VOCs and sVOCs), polycyclic aromatic hydrocarbons (PAHs), and metals. These contaminants have been shown to be or are suspected to be present in site soil, sediment, and/or groundwater. A list of these COCs is provided in Table 4 in the Remedial Investigation Work Plan.

Chemical information sheets for COCs most likely to be encountered on the Site are included as Appendix II in this document.

4.2.1 Worker Protections for Chemical Hazards

Impermeable gloves will be donned prior to handling drilling tools and/or site media (e.g., soil, groundwater) which are suspected to have encountered contaminants. Field personnel will avoid direct skin and eye contact with impacted soil and groundwater.

Eating, drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand-to-mouth transfer and ingestion of site materials is prohibited in the active work zone.

All project work is anticipated to be completed outdoors in an open-air environment. Therefore, significant concentrations of hazardous vapors or air pollutants are not expected. However, if field monitoring equipment (PID) detects consistently elevated concentrations of air pollutants in ambient air in the work area, work may cease, and workers will clear the area until concentrations drop below routine background levels.

4.2.2 Decontamination Procedures

Personnel decontamination may be necessary for personnel coming into contact with contaminated media on the site. Personnel decontamination will consist of washing or brushing off safety footwear, disposal of gloves and other personal protective equipment in plastic garbage bags and washing of exposed areas of skin as needed.

Equipment associated with the drilling work, including drill rods and other downhole equipment, as well as all hand sampling equipment (e.g., shovels, buckets, etc.) will be washed with soap and water between each sampling location. Wash water will be captured and stored in drums along with temporary well purge water until proper off-site disposal can be arranged.



4.2.3 Waste Management

Drilling and soil excavation activities will generate investigation-derived waste (IDW) including soil cuttings and water generated during decontamination of equipment and supplies.

Groundwater sampling will generate purge water. IDW will be stored in labeled drums on site until characterization is complete and the contents can be properly disposed. IDW should not be handled unless proper personal protection equipment (PPE) is used.

Single-use project materials including PPE and sampling supplies will be bagged at the end of each day and disposed of as solid waste.

4.3 Physical Hazards

Fieldwork on an industrial site such as the Lovric's Sea Craft Site may involve a variety of physical hazards, including but not limited to operation of heavy machinery, potential contact with overhead and underground utilities and objects, manual lifting of heavy objects, high levels of noise, incursions into an unsecured work area, and slip/trip/fall hazards.

Activities that may be performed on site involve hydraulic probing operations, powered drilling equipment, and shoveling.

4.3.1 Utility Contact Mitigation

Before drilling, hydraulic soil probing, or excavation work takes place, underground utilities must be located and marked. Stratum Group personnel will submit a ticket to the Washington State One-Call system at least two full business days prior to the start of ground disturbing activities. Review of site utility drawing and a private utility locating company will also be utilized to locate utilities not under the public utility One Call purview and clear all subsurface exploration locations prior to the start of ground disturbing activities.

Any time drill rig equipment is mobilizing around the site or raising the mast to begin drilling, drillers and Stratum Group personnel will act as spotters to observe the area overhead to check for potential utility lines or other overhead obstructions to proper equipment movement and operation. The drill rig should be positioned at least 10 feet from all overhead power lines.

4.3.2 Worker Protections for Physical Hazards

All personnel working around drill rigs and heavy equipment will be familiarized with emergency shut-down procedures and the position of "kill" switches. No loose-fitting clothing, jewelry or unsecured long hair will be permitted near the equipment. Hands and feet should be kept away from all moving parts of the drill rig while drilling is in progress, except for trained and licensed drillers and driller helpers. Daily inspection of all ropes, cables, and moving parts is mandatory.



To avoid impacts from high levels of noise, field personnel should wear hearing protection (e.g., earplugs, earmuffs, etc.) whenever the drill rig is operating. Hearing protection may also be warranted when general Site noise (e.g., ship repair activities) becomes too loud for general conversation to continue.

The active work zone will be barricaded as much as is practicable to isolate the work area from pedestrians, site workers, and vehicles. If Stabbert Maritime personnel need to cross through the work area as part of active shipyard operations, and an alternative route is not possible, project work will stop until the work area is again secure.

The project Site is located adjacent to waters of Guemes Channel. This positioning introduces risks associated with water immersion and/or falling from elevated bulkheads or piers. To mitigate these risks, all work activities will take place at least 10 feet away from the water and 10 feet away from the edge of bulkheads or other elevated work areas on the Site. Colorful physical barriers may be erected along the top edge of bulkheads or similar elevated areas to reduce the likelihood of inadvertent falls. No overwater work is planned at this time.

A stocked first aid kit will be kept on site at all times in a Stratum Group field vehicle. If injuries more significant than minor cuts and scrapes are incurred, project work will stop, and personnel should be taken to a medical professional for proper attention.

Other general physical hazards which may be present on this project site and methods of mitigating their risk include:

- Lifting & Ergonomic Stress - Use proper lifting techniques to avoid back injury. Lift with the legs, not the back. Keep loads close to the body and avoid twisting. Loads heavier than 50 pounds (lbs) require a second person or mechanical device for lifting. Use mechanical devices such as drum dollies, hand trucks, and tool hoists (for lifting augers) to lift or move heavy loads whenever possible. When working with a heavy tool or object, keep legs under the load and do not overreach or twist to the side. Reposition body to be more square to the load and work. Push loads, rather than pull, whenever feasible. Do not persist with lifting when the load is too heavy. Use a mechanical lifting aid or have a coworker assist with the lift. Rotate repetitive tasks to avoid soft-tissue fatigue.
- Fire and Explosion - Fire extinguishers will be accessible in the work area. Store flammables in Underwriter's Laboratory and Occupational Safety and Health Administration (OSHA) approved metal safety cans equipped with spark arrestors. Store flammable containers more than 50 ft from possible ignition sources. Keep exhaust equipment powered by internal combustion engines well away from flammables and combustibles. Never refuel equipment (e.g., generators) while it is in operation or hot enough to ignite fuel vapors. Conspicuously mark operations that pose fire hazards "No Smoking" or "Open Flames." Remove trash, weeds, and unnecessary combustibles from



the hot equipment.

- Vehicles - Always be aware and stay alert to vehicle and equipment traffic around the work area. If equipment other than the drill rig needs to cross through the work area, project work should stop until the work area is cleared of non-project personnel and equipment. When operating a vehicle to and from the work site, obey all site traffic signs and speed limits. Seat belts must be functional and in use during operation of any site vehicles (including rentals). Operator shall regularly inspect the vehicle for defective parts, such as brakes, controls, motor, chassis and drives.
- Slips, Trips, and Falls - Clear work area of obstructions and debris before setting up. Alter work areas as necessary to provide a safe, reasonably level area. All walking and working surfaces shall continually be inspected and maintained to be free of slip, trip, and fall hazards. Keep platforms, stairs, and immediate work areas clear. Do not allow oil, grease, or excessive mud to accumulate in these areas. Eliminate slip, trip, and fall hazards or identify them clearly with caution tape, barricades, or equivalent means. Store loose or light material and debris in designated areas or containers. Secure tools, materials, and equipment subject to displacement or falling.

4.4 Weather Hazards

Weather conditions on the project Site can pose a variety of hazards to personnel and equipment including excessive cold, excessive heat, high winds, precipitation, and electrical storms.

Caution should be taken as weather conditions can change rapidly. Prior to arriving on site, personnel should check the weather forecast and prepare with proper clothing and field equipment. Prior to beginning daily work, the site should be surveyed for any changes due to weather including flooding and slip/fall hazards.

The project may be shut down during the following inclement weather conditions:

- poor visibility
- precipitation severe enough to impair safe movement or travel or posing a high slip/trip/fall hazard
- lightning in the immediate area
- steady winds in excess of 23 mph or at the discretion of the drilling team
- local air quality registering an AQI of 100 or greater (PM2.5)
- other conditions as determined by the Project Manager.

Work will resume when the conditions are deemed safe by the Project Manager and all project personnel are comfortable continuing field activities. If lightning is observed or thunder is heard, work shall immediately cease until the storm has passed.

During portions of the spring, summer, and fall months, site conditions have the potential for



heat stress to affect site personnel. Strenuous work in protective clothing may also increase perspiration and the potential for heat stress. At least one gallon of water will be available for each field employee during each day of site activity. The Project Manager or Stratum Group field representative (if different) will observe all project personnel for signs of heat stress (excessive perspiration, flushed skin, nausea, etc.). If such signs are observed, affected workers will be required to leave the work area, loosen protective clothing, drink water, and rest in a shaded area for at least 15 minutes. Fluid replacement will be encouraged during each rest period.

4.5 Biological Hazards

Biological hazards such as snakes and wild animals, although unlikely, could be encountered in areas of the project site. Never try to capture wild or semi-wild animals, as they may bite you or infect you with parasites.

Stinging insects such as wasps, mosquitos and ticks could also be encountered in outdoor environments. Use immediate first aid measures to treat any insect bites. A physician should be consulted regarding removal of ticks that may be detected following site work.

Employees are instructed to watch for the presence of poisonous plants such as poison ivy or poison oak, and to avoid such plants. Project work will not expose workers to infectious agents or wastes; however, responders to first aid incidents could contact bloodborne pathogens. Always treat human blood and bodily fluids as potentially infected with disease and take the proper precautions when coming into contact with these fluids.

4.6 Training/Education Requirements

All Stratum Group and subcontractor personnel participating in ground disturbing activities on this Site must have completed 40-hour Hazardous Waste Site Training and at least three days supervised field experience per the requirements of OSHA 29 CFR 1910.120. In addition, a current 8-hour annual refresher training certificate will be required for all Stratum Group field personnel.

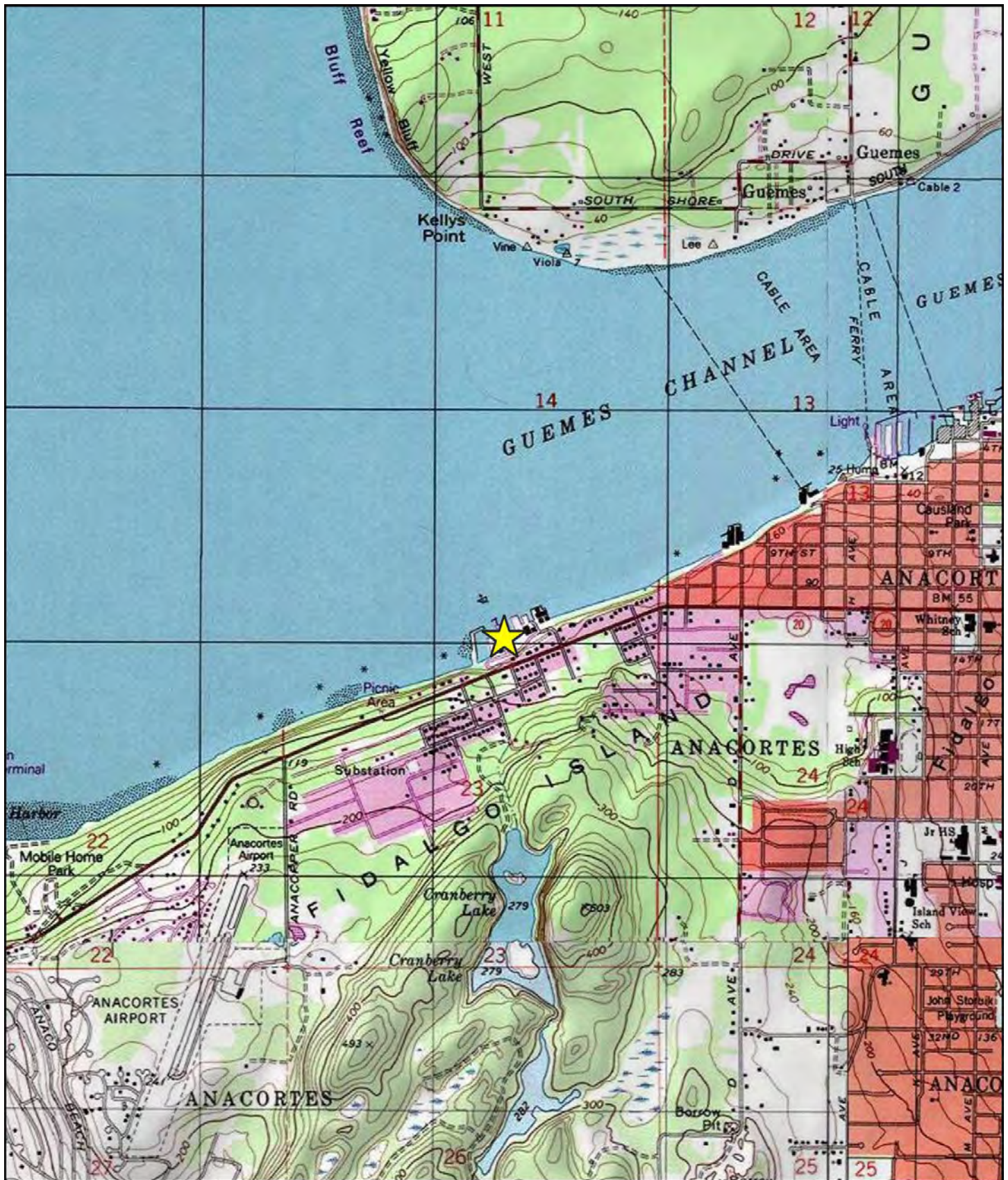
Prior to the start of site activities, all Stratum Group project personnel will participate in a pre-project safety and health briefing outlining the contents of this Plan. The personnel responsible for project safety and health will be addressed, as will site history, scope of work, site control measures, emergency procedures and site communications. Daily "tailgate" safety and health briefings will be presented by the Project Manager at the start of each workday. In addition to a general review of the proposed daily activity and safety requirements, findings from the previous day's work that could impact the health and safety of site workers, and any procedural changes will be addressed.



APPENDIX I

Figure 1 – Site Vicinity Map

Figure 2 – Annotated Site Map and Areas of Environmental Concern
Map & Directions to Nearest Hospital



Subject Property

Vicinity Map

Lovric's Sea-Craft
3022 Oakes Avenue
Anacortes, WA 98221

Figure 1

0 0.25 0.5 mi



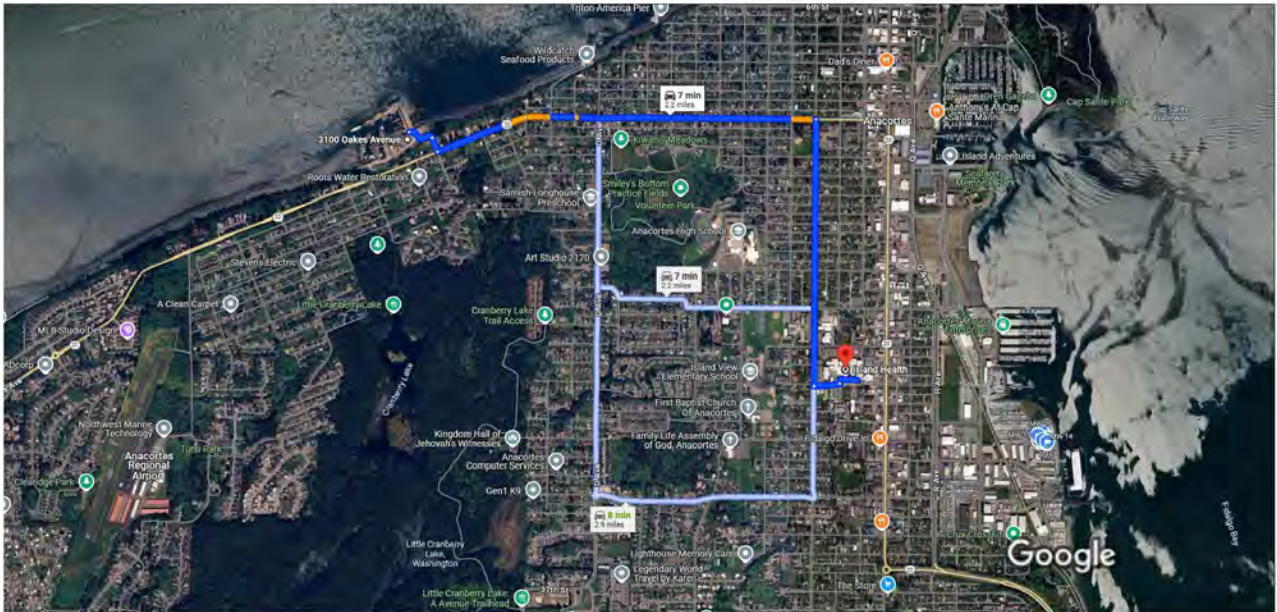
N





 3100 Oakes Ave, Anacortes, WA 98221 to Island Health, 1211 24th St, Anacortes, WA 98221

Drive 2.2 miles, 7 min



Imagery ©2024 Airbus, CNES / Airbus, Maxar Technologies, USDA/FPAC/GEO, Map data ©2024 Google 1000 ft

3100 Oakes Ave

Anacortes, WA 98221

- ↑

1. Head east toward Dakota Ave

440 ft
- ↗

2. Continue onto Dakota Ave

236 ft
- ↶

3. Turn left onto Oakes Ave

0.3 mi
- ↑

4. Continue onto 12th St

0.9 mi
- ↘

5. Turn right onto M Ave

0.8 mi
- ↶

6. Turn left onto 26th St

410 ft
- ↶

7. Turn left

 Destination will be on the left

338 ft

Island Health

1211 24th St, Anacortes, WA 98221

APPENDIX II

Chemical Information Sheets



CAMEO Chemicals



Chemical Datasheet

ACETONE



Chemical Identifiers

CAS Number67-64-1 **UN/NA Number**

1090

DOT Hazard Label

Flammable Liquid

USCG CHRIS Code

ACT

NIOSH Pocket Guide

Acetone

International Chem Safety Card

ACETONE

NFPA 704

Diamond	Hazard	Value	Description
3 1 0	 Health	1	Can cause significant irritation.
	 Flammability	3	Can be ignited under almost all ambient temperature conditions.
	 Instability	0	Normally stable, even under fire conditions.
	 Special		

(NFPA, 2010)

General Description

A clear colorless liquid with a sweetish odor. Flash point 0°F. Less dense than water. Vapors are heavier than air. Used as a solvent in paint and nail polish removers.

Hazards

Reactivity Alerts

Highly Flammable

Air & Water Reactions

Highly flammable. Water soluble.

Fire Hazard

Excerpt from ERG Guide 127 [Flammable Liquids (Water-Miscible)]:

HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames. **CAUTION:** Ethanol (UN1170) can burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.) Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Most vapors are heavier than air. They will spread along the ground and collect in low or confined areas (sewers, basements, tanks, etc.). Vapor explosion hazard indoors, outdoors or in sewers. Those substances designated with a (P) may polymerize explosively when heated or involved in a fire. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Many liquids will float on water. (ERG, 2024)

Health Hazard

INHALATION: vapor irritating to eyes and mucous membranes; acts as an anesthetic in very high concentrations. **INGESTION:** low order of toxicity but very irritating to mucous membranes. **SKIN:** prolonged excessive contact causes defatting of the skin, possibly leading to dermatitis. (USCG, 1999)

Reactivity Profile

It was reported that a mixture of ACETONE and chloroform, in a residue bottle, exploded. Since addition of acetone to chloroform in the presence of base will result in a highly exothermic reaction, it is thought that a base was in the bottle [MCA Case History 1661. 1970]. Also, Nitrosyl chloride, sealed in a tube with a residue of acetone in the presence of platinum catalyst, gave an explosive reaction [Chem. Eng. News 35(43):60. 1967]. The reaction of nitrosyl perchlorate and acetone ignites and explodes. Explosions occur with mixtures of nitrosyl perchlorate and primary amine [Ann. Chem. 42:2031. 1909]. Reacts violently with nitric acid. Also causes exothermic reaction when in contact with aldehydes.

Belongs to the Following Reactive Group(s)

- Ketones

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 127 [Flammable Liquids (Water-Miscible)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area for at least 50 meters (150 feet) in all directions.

LARGE SPILL: Consider initial downwind evacuation for at least 300 meters (1000 feet).

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 127 [Flammable Liquids (Water-Miscible)]:

CAUTION: The majority of these products have a very low flash point. Use of water spray when fighting fire may be inefficient. **CAUTION:** For fire involving UN1170, UN1987 or UN3475, alcohol-resistant foam should be used. **CAUTION:** Ethanol (UN1170) can burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.).

SMALL FIRE: Dry chemical, CO₂, water spray or alcohol-resistant foam.

LARGE FIRE: Water spray, fog or alcohol-resistant foam. Avoid aiming straight or solid streams directly onto the product. If it can be done safely, move undamaged containers away from the area around the fire.

FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.

ALWAYS stay away from tanks in direct contact with flames. For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 127 [Flammable Liquids (Water-Miscible)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A vapor-suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean, non-sparking tools to collect absorbed material.

LARGE SPILL: Dike far ahead of liquid spill for later disposal. Water spray may reduce vapor, but may not prevent ignition in closed spaces. (ERG, 2024)

Protective Clothing

Excerpt from NIOSH Pocket Guide for Acetone:

Skin: PREVENT SKIN CONTACT - Wear appropriate personal protective clothing to prevent skin contact.

Eyes: PREVENT EYE CONTACT - Wear appropriate eye protection to prevent eye contact.

Wash skin: WHEN CONTAMINATED - The worker should immediately wash the skin when it becomes contaminated.

Remove: WHEN WET (FLAMMABLE) - Work clothing that becomes wet should be immediately removed due to its flammability hazard (i.e., for liquids with a flash point <100°F).

Change: No recommendation is made specifying the need for the worker to change clothing after the workshift. (NIOSH, 2024)

DuPont Tychem® Suit Fabrics

Normalized Breakthrough Times (in Minutes)

Chemical	CAS Number	State	QS	QC	SL	C3	TF	TP	RC	TK	RF
Acetone	67-64-1	Liquid	imm	imm	13	462	>480	>480	>480	>480	>480
Dimethyl ketal	67-64-1	Liquid	imm	imm	13	462	>480	>480	>480	>480	>480
Dimethyl ketone	67-64-1	Liquid	imm	imm	13	462	>480	>480	>480	>480	>480
Ketone propane	67-64-1	Liquid	imm	imm	13	462	>480	>480	>480	>480	>480
Methyl acetyl	67-64-1	Liquid	imm	imm	13	462	>480	>480	>480	>480	>480
Methyl ketone	67-64-1	Liquid	imm	imm	13	462	>480	>480	>480	>480	>480

Chemical	CAS Number	State	QS	QC	SL	C3	TF	TP	RC	TK	RF
Propan -2-one	67-64-1	Liquid	imm	imm	13	462	>480	>480	>480	>480	>480
Pyroacetic ether	67-64-1	Liquid	imm	imm	13	462	>480	>480	>480	>480	>480

> indicates greater than.

"imm" indicates immediate; having a normalized breakthrough time of 10 minutes or less.

Special Warning from DuPont: Tychem® and Tyvek® fabrics should not be used around heat, flames, sparks or in potentially flammable or explosive environments. Only...

(DuPont, 2024)

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

Physical Properties

Chemical Formula: C3H6O

Flash Point: 0°F (NTP, 1992)

Lower Explosive Limit (LEL): 2.6 % (NTP, 1992)

Upper Explosive Limit (UEL): 12.8 % (NTP, 1992)

Autoignition Temperature: 869°F (USCG, 1999)

Melting Point: -137°F (NTP, 1992)

Vapor Pressure: 180 mmHg at 68°F ; 270 mmHg at 86°F (NTP, 1992)

Vapor Density (Relative to Air): 2 (NTP, 1992) - Heavier than air; will sink

Specific Gravity: 0.791 at 68°F (USCG, 1999) - Less dense than water; will float

Boiling Point: 133°F at 760 mmHg (NTP, 1992)

Molecular Weight: 58.08 (NTP, 1992)

Water Solubility: greater than or equal to 100 mg/mL at 72°F (NTP, 1992)

Ionization Energy/Potential: 9.69 eV (NIOSH, 2024)

IDLH: 2500 ppm ; Based on 10% of the lower explosive limit. (NIOSH, 2024)

AEGLs (Acute Exposure Guideline Levels)

Interim AEGLs for Acetone (67-64-1)

Exposure Period	AEGL-1	AEGL-2	AEGL-3
10 minutes	200 ppm	9300 ppm 	16000 ppm  
30 minutes	200 ppm	4900 ppm 	8600 ppm 
60 minutes	200 ppm	3200 ppm 	5700 ppm 
4 hours	200 ppm	1400 ppm	2500 ppm
8 hours	200 ppm	950 ppm	1700 ppm

Lower Explosive Limit (LEL) = 26000 ppm

 indicates value is 10-49% of LEL. Safety consideration against explosions must be taken into account.

  indicates value is 50-99% of LEL. Extreme safety consideration against explosions must be taken into account.

Level of Distinct Odor Awareness = 160 ppm

(NAC/NRC, 2024)

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3	
Acetone (67-64-1)	200 ppm	3200 ppm 	5700 ppm 	LEL = 26000 ppm

 indicates value is 10-49% of LEL.

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Acetone	67-64-1			5000 pounds		U002	

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- ACETONE
- BETA-KETOPROPANE
- CHEVRON ACETONE
- DIMETHYL KETONE
- DIMETHYLFORMALDEHYDE
- DIMETHYLKETAL
- KETONE PROPANE
- KETONE, DIMETHYL
- METHYL KETONE
- PROPANONE
- 2-PROPANONE
- PYROACETIC ACID
- PYROACETIC ETHER

**CAMEO** *Chemicals***Chemical Datasheet****ARSENIC****Chemical Identifiers**

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
7440-38-2	1558	Poison	ARX
NIOSH Pocket Guide		International Chem Safety Card	
Arsenic (inorganic compounds, as As)		ARSENIC	

NFPA 704

data unavailable

General Description

A grayish metallic solid that turns black upon exposure to air. Insoluble in water. Toxic by ingestion.

Hazards**Reactivity Alerts**

none

Air & Water Reactions

Turns black on exposure to air. Insoluble in water.

Fire Hazard

Special Hazards of Combustion Products: Contain highly toxic arsenic trioxide and other forms of arsenic. Arsenic gas, the most dangerous form of arsenic, is produced upon contact with an acid or acid fumes.

Behavior in Fire: Burns to produce dense white fumes of highly toxic arsenic trioxide. (USCG, 1999)

Health Hazard

Poisonous by inhalation of dust or by ingestion. Regardless of exposure route, symptoms in most cases are characteristic of severe gastritis or gastroenteritis. All chemical forms of arsenic eventually produce similar toxic effects. Symptoms may be delayed. (USCG, 1999)

Reactivity Profile

ARSENIC reacts incandescently with bromine trifluoride, even at 10°C [Mellor 2:113 1946-47]. Causes bromoazide to

explode upon contact. Ignites if ground up together with solid potassium permanganate [Mellor 12:322 1946-47]. Is oxidized by sodium peroxide with incandescence [Mellor 2:490-93 1946-47]. A combination of finely divided arsenic with finely divided bromates (also chlorates and iodates) of barium, calcium, magnesium, potassium, sodium, or zinc can explode by heat, percussion, and friction [Mellor 2:310 1946-47]. Bromine pentafluoride reacts readily in the cold with arsenic. Ignition usually occurs. Reacts vigorously with fluorine at ordinary temperatures [Mellor 9:34 1946-47].

Belongs to the Following Reactive Group(s)

- Metals, Less Reactive

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 152 [Substances - Toxic (Combustible)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 152 [Substances - Toxic (Combustible)]:

SMALL FIRE: Dry chemical, CO2 or water spray.

LARGE FIRE: Water spray, fog or regular foam. If it can be done safely, move undamaged containers away from the area around the fire. Dike runoff from fire control for later disposal. Avoid aiming straight or solid streams directly onto the product.

FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 152 [Substances - Toxic (Combustible)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. Cover with plastic sheet to prevent spreading. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. **DO NOT GET WATER INSIDE CONTAINERS.** (ERG, 2024)

Protective Clothing

Excerpt from NIOSH Pocket Guide for Arsenic (inorganic compounds, as As):

Skin: PREVENT SKIN CONTACT - Wear appropriate personal protective clothing to prevent skin contact.

Eyes: PREVENT EYE CONTACT - Wear appropriate eye protection to prevent eye contact.

Wash skin:

- WHEN CONTAMINATED - The worker should immediately wash the skin when it becomes contaminated.
- DAILY - The worker should wash daily at the end of each work shift, and prior to eating, drinking, smoking, etc.

Remove: WHEN WET OR CONTAMINATED - Work clothing that becomes wet or significantly contaminated should be removed and replaced.

Change: DAILY - Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises.

Provide:

- EYEWASH - Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substances; this is irrespective of the recommendation involving the wearing of eye protection.
- QUICK DRENCH - Facilities for quickly drenching the body should be provided within the immediate work area for emergency use where there is a possibility of exposure. [Note: It is intended that these facilities provide a sufficient quantity or flow of water to quickly remove the substance from any body areas likely to be exposed. The actual determination of what constitutes an adequate quick drench facility depends on the specific circumstances. In certain instances, a deluge shower should be readily available, whereas in others, the availability of water from a sink or hose could be considered adequate.] (NIOSH, 2024)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

Excerpt from NIOSH Pocket Guide for Arsenic (inorganic compounds, as As):

Eye: IRRIGATE IMMEDIATELY - If this chemical contacts the eyes, immediately wash (irrigate) the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately.

Skin: SOAP WASH IMMEDIATELY - If this chemical contacts the skin, immediately wash the contaminated skin with soap and water. If this chemical penetrates the clothing, immediately remove the clothing, wash the skin with soap and water, and get medical attention promptly.

Breathing: RESPIRATORY SUPPORT - If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

Swallow: MEDICAL ATTENTION IMMEDIATELY - If this chemical has been swallowed, get medical attention immediately. (NIOSH, 2024)

Physical Properties

Chemical Formula: As

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: 1135°F (Sublimes) (NIOSH, 2024)

Vapor Pressure: 0 mmHg (approx) (NIOSH, 2024)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 5.727 at 77°F (USCG, 1999) - Denser than water; will sink

Boiling Point: 1135°F at 760 mmHg (sublimes) (USCG, 1999)

Molecular Weight: 74.9216 (USCG, 1999)

Water Solubility: Insoluble (NIOSH, 2024)

Ionization Energy/Potential: data unavailable

IDLH: 5 mg As/m³ ; A potential occupational carcinogen. (NIOSH, 2024)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Arsenic (7440-38-2)	1.5 mg/m ³	17 mg/m ³	100 mg/m ³

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Arsenic ††	7440-38-2			1 pound	313		
Arsenic Compounds	N020			&	313		

†† indicates that no reporting of releases of this CERCLA hazardous substance is required under CERCLA if the diameter of the pieces of the solid metal released is larger than 100 micrometers (0.004 inches).

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- ARSENIC
- ARSENIC BLACK
- ARSENIC METAL: ARSENIA
- ARSENIC, METALLIC
- ARSENIC, SOLID
- ARSENIC, [SOLID]
- ARSENIC-75
- GRAY ARSENIC

**CAMEO** *Chemicals*[Print](#)**Chemical Datasheet****BENZENE****Chemical Identifiers****CAS Number**71-43-2 **UN/NA Number**

1114

DOT Hazard Label

Flammable Liquid

USCG CHRIS Code

BNZ

NIOSH Pocket Guide

Benzene

International Chem Safety Card

BENZENE

NFPA 704

Diamond	Hazard	Value	Description
3 2 0	 Health	2	Can cause temporary incapacitation or residual injury.
	 Flammability	3	Can be ignited under almost all ambient temperature conditions.
	 Instability	0	Normally stable, even under fire conditions.
	 Special		

(NFPA, 2010)

General Description

A clear colorless liquid with a petroleum-like odor. Flash point less than 0°F. Less dense than water and slightly soluble in water. Hence floats on water. Vapors are heavier than air.

Hazards**Reactivity Alerts**

Highly Flammable

Air & Water Reactions

Highly flammable. Slightly soluble in water.

Fire Hazard

Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. (USCG, 1999)

Health Hazard

Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction, nausea, and vomiting. Coma and possible death. (USCG, 1999)

Reactivity Profile

BENZENE reacts vigorously with allyl chloride or other alkyl halides even at -70°C in the presence of ethyl aluminum dichloride or ethyl aluminum sesquichloride. Explosions have been reported [NFPA 491M 1991]. Ignites in contact with powdered chromic anhydride [Mellor 11:235 1946-47]. Incompatible with oxidizing agents such as nitric acid. Mixtures with bromine trifluoride, bromine pentafluoride, iodine pentafluoride, iodine heptafluoride and other interhalogens can ignite upon heating [Bretherick 5th ed. 1995]. Benzene and cyanogen halides yield HCl as a byproduct (Hagedorn, F. H. Gelbke, and Federal Republic of Germany. 2002. Nitriles. In Ullmann's Encyclopedia of Industrial Chemistry. Wiley-VCH Verlag GmbH & Co. KGaA.). The reaction of benzene and trichloroacetonitrile evolves toxic chloroform and HCl gases. (Hagedorn, F., H.-P. Gelbke, and Federal Republic of Germany. 2002. Nitriles. In Ullmann's Encyclopedia of Industrial Chemistry. Wiley-VCH Verlag GmbH & Co. KGaA.).

Belongs to the Following Reactive Group(s)

- Hydrocarbons, Aromatic

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 130 [Flammable Liquids (Water-Immiscible / Noxious)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area for at least 50 meters (150 feet) in all directions.

LARGE SPILL: Consider initial downwind evacuation for at least 300 meters (1000 feet).

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 130 [Flammable Liquids (Water-Immiscible / Noxious)]:

CAUTION: The majority of these products have a very low flash point. Use of water spray when fighting fire may be inefficient.

SMALL FIRE: Dry chemical, CO₂, water spray or regular foam. If regular foam is ineffective or unavailable, use alcohol-resistant foam.

LARGE FIRE: Water spray, fog or regular foam. If regular foam is ineffective or unavailable, use alcohol-resistant foam. Avoid aiming straight or solid streams directly onto the product. If it can be done safely, move undamaged containers away from the area around the fire.

FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.

ALWAYS stay away from tanks in direct contact with flames. For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 130 [Flammable Liquids (Water-Immiscible / Noxious)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A vapor-suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean, non-sparking tools to collect absorbed material.

LARGE SPILL: Dike far ahead of liquid spill for later disposal. Water spray may reduce vapor, but may not prevent ignition in closed spaces. (ERG, 2024)

Protective Clothing

Excerpt from NIOSH Pocket Guide for Benzene:

Skin: PREVENT SKIN CONTACT - Wear appropriate personal protective clothing to prevent skin contact.

Eyes: PREVENT EYE CONTACT - Wear appropriate eye protection to prevent eye contact.

Wash skin: WHEN CONTAMINATED - The worker should immediately wash the skin when it becomes contaminated.

Remove: WHEN WET (FLAMMABLE) - Work clothing that becomes wet should be immediately removed due to its flammability hazard (i.e., for liquids with a flash point <100°F).

Change: No recommendation is made specifying the need for the worker to change clothing after the workshift.

Provide:

- EYEWASH - Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substances; this is irrespective of the recommendation involving the wearing of eye protection.
- QUICK DRENCH - Facilities for quickly drenching the body should be provided within the immediate work area for emergency use where there is a possibility of exposure. [Note: It is intended that these facilities provide a sufficient quantity or flow of water to quickly remove the substance from any body areas likely to be exposed. The actual determination of what constitutes an adequate quick drench facility depends on the specific circumstances. In certain instances, a deluge shower should be readily available, whereas in others, the availability of water from a sink or hose could be considered adequate.] (NIOSH, 2024)

DuPont Tychem® Suit Fabrics

Normalized Breakthrough Times (in Minutes)

Chemical	CAS Number	State	QS	QC	SL	C3	TF	TP	RC	TK	RF
Benzene	71-43-2	Liquid			imm	>480	>480	>480	>480	>480	>480

> indicates greater than.

"imm" indicates immediate; having a normalized breakthrough time of 10 minutes or less.

Special Warning from DuPont: Tychem® and Tyvek® fabrics should not be used around heat, flames, sparks or in potentially flammable or explosive environments. Only...

(DuPont, 2024)

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. IMMEDIATELY call a hospital or poison control center even if no symptoms (such as redness or irritation) develop. IMMEDIATELY transport the victim to a hospital for treatment after washing the affected areas.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital.

OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

Physical Properties

Chemical Formula: C₆H₆

Flash Point: 12°F (NTP, 1992)

Lower Explosive Limit (LEL): 1.4 % (NTP, 1992)

Upper Explosive Limit (UEL): 8 % (NTP, 1992)

Autoignition Temperature: 1097°F (USCG, 1999)

Melting Point: 41.9°F (NTP, 1992)

Vapor Pressure: 60 mmHg at 59°F ; 76 mmHg at 68°F (NTP, 1992)

Vapor Density (Relative to Air): 2.77 (NTP, 1992) - Heavier than air; will sink

Specific Gravity: 0.879 at 68°F (USCG, 1999) - Less dense than water; will float

Boiling Point: 176.2°F at 760 mmHg (NTP, 1992)

Molecular Weight: 78.11 (NTP, 1992)

Water Solubility: 1 to 5 mg/mL at 64°F (NTP, 1992)

Ionization Energy/Potential: 9.24 eV (NIOSH, 2024)

IDLH: 500 ppm ; A potential occupational carcinogen. (NIOSH, 2024)

AEGLs (Acute Exposure Guideline Levels)

Interim AEGLs for Benzene (71-43-2)

Exposure Period	AEGL-1	AEGL-2	AEGL-3
10 minutes	130 ppm	2000 ppm 	9700 ppm  
30 minutes	73 ppm	1100 ppm	5600 ppm 
60 minutes	52 ppm	800 ppm	4000 ppm 
4 hours	18 ppm	400 ppm	2000 ppm 
8 hours	9 ppm	200 ppm	990 ppm

Lower Explosive Limit (LEL) = 14000 ppm

 indicates value is 10-49% of LEL. Safety consideration against explosions must be taken into account.

  indicates value is 50-99% of LEL. Extreme safety consideration against explosions must be taken into account.
(NAC/NRC, 2024)

ERPGs (Emergency Response Planning Guidelines)

Chemical	ERPG-1	ERPG-2	ERPG-3
Benzene (71-43-2)	50 ppm 	150 ppm	1000 ppm

 indicates that odor should be detectable near ERPG-1.

(AIHA, 2022)

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3	
Benzene (71-43-2)	52 ppm	800 ppm	4000 ppm 	LEL = 14000 ppm

 indicates value is 10-49% of LEL.

(DOE, 2024)

Regulatory Information**EPA Consolidated List of Lists**

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Benzene ^a	71-43-2			10 pounds	313	U019	

^a indicates that benzene was already a CERCLA hazardous substance prior to the CAA Amendments of 1990 and received an adjusted 10-pound RQ based on potential carcinogenicity in an August 14, 1989, final rule (54 FR 33418). The CAA Amendments specify that “benzene (including benzene from gasoline)” is a hazardous air pollutant and, thus, a CERCLA hazardous substance.

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- (6)ANNULENE
- [6]ANNULENE
- BENZENE
- BENZIN
- BENZINE
- BENZOL
- BENZOLE
- BENZOLENE
- BICARBURET OF HYDROGEN
- CARBON OIL
- COAL NAPHTHA
- CYCLOHEXATRIENE
- 1,3,5-CYCLOHEXATRIENE
- MINERAL NAPHTHA
- MOTOR BENZOL
- NCI-C55276
- NITRATION BENZENE
- PHENE
- PHENYL HYDRIDE
- PYROBENZOL
- PYROBENZOLE

**CAMEO** *Chemicals***Chemical Datasheet****CADMIUM****Chemical Identifiers**

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
7440-43-9	2570	Poison	none
NIOSH Pocket Guide		International Chem Safety Card	
Cadmium dust (as Cd)		CADMIUM	

NFPA 704

data unavailable

General Description

PHYSICAL DESCRIPTION: Silver-white blue tinged lustrous metallic solid. (NTP, 1992)

Hazards**Reactivity Alerts**

Pyrophoric

Air & Water Reactions

The finely divided metal is pyrophoric. Slowly oxidized by moist air to form cadmium oxide. Insoluble in water.

Fire Hazard

Flammable in powder form. Combustible. (NTP, 1992)

Health Hazard

Excerpt from NIOSH Pocket Guide for Cadmium dust (as Cd):

Exposure Routes: Inhalation, ingestion

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

Target Organs: Respiratory system, kidneys, prostate, blood

Cancer Site: Prostatic & lung cancer (NIOSH, 2024)

Reactivity Profile

A violent explosion occurred 30 minutes after placement of a CADMIUM rod into hydrazoic acid [Mellor 8 Supp. 2:50 1967]. Fused ammonium nitrate with powdered metal often produces a violent explosive reaction. Reactivity similar to zinc. May be incompatible with oxidants.

Belongs to the Following Reactive Group(s)

- Metals, Elemental and Powder, Active

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

To extinguish a fire involving this chemical you may use a dry chemical, carbon dioxide, foam or halon extinguisher; a water spray may also be used. (NTP, 1992)

Non-Fire Response

SMALL SPILLS AND LEAKAGE: If you spill this chemical, you should dampen the solid spill material with water, then transfer the dampened material to a suitable container. Use absorbent paper dampened with water to pick up any remaining material. Seal your contaminated clothing and the absorbent paper in a vapor-tight plastic bag for eventual disposal. Wash all contaminated surfaces with a strong soap and water solution. Do not reenter the contaminated area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.

STORAGE PRECAUTIONS: You should keep this material in a tightly-closed container under an inert atmosphere, and store it in a freezer. (NTP, 1992)

Protective Clothing

Excerpt from NIOSH Pocket Guide for Cadmium dust (as Cd):

Skin: No recommendation is made specifying the need for personal protective equipment for the body.

Eyes: No recommendation is made specifying the need for eye protection.

Wash skin: DAILY - The worker should wash daily at the end of each work shift, and prior to eating, drinking,

smoking, etc.

Remove: No recommendation is made specifying the need for removing clothing that becomes wet or contaminated.

Change: DAILY - Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises. (NIOSH, 2024)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: Some heavy metals are VERY TOXIC POISONS, especially if their salts are very soluble in water (e.g., lead, chromium, mercury, bismuth, osmium, and arsenic). IMMEDIATELY call a hospital or poison control center and locate activated charcoal, egg whites, or milk in case the medical advisor recommends administering one of them. Also locate Ipecac syrup or a glass of salt water in case the medical advisor recommends inducing vomiting. Usually, this is NOT RECOMMENDED outside of a physician's care. If advice from a physician is not readily available and the victim is conscious and not convulsing, give the victim a glass of activated charcoal slurry in water or, if this is not available, a glass of milk, or beaten egg whites and IMMEDIATELY transport victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, assure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital.

OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

Physical Properties

Chemical Formula: Cd

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: 609.6°F (NTP, 1992)

Vapor Pressure: 1 mmHg at 741°F (NTP, 1992)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 8.642 (NTP, 1992) - Denser than water; will sink

Boiling Point: 1409°F at 760 mmHg (NTP, 1992)

Molecular Weight: 112.41 (NTP, 1992)

Water Solubility: Insoluble (NIOSH, 2024)

Ionization Energy/Potential: data unavailable

IDLH: 9 mg Cd/m³ ; A potential occupational carcinogen. (NIOSH, 2024)

AEGLs (Acute Exposure Guideline Levels)

Interim AEGLs for Cadmium (7440-43-9)

Exposure Period	AEGL-1	AEGL-2	AEGL-3
10 minutes	0.13 mg/m ³	1.4 mg/m ³	8.5 mg/m ³
30 minutes	0.13 mg/m ³	0.96 mg/m ³	5.9 mg/m ³
60 minutes	0.1 mg/m ³	0.76 mg/m ³	4.7 mg/m ³
4 hours	0.063 mg/m ³	0.4 mg/m ³	1.9 mg/m ³
8 hours	0.041 mg/m ³	0.2 mg/m ³	0.93 mg/m ³

(NAC/NRC, 2024)

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Cadmium (7440-43-9)	0.1 mg/m ³	0.76 mg/m ³	4.7 mg/m ³

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Cadmium ††	7440-43-9			10 pounds	313		
Cadmium Compounds	N078			&	313		

†† indicates that no reporting of releases of this CERCLA hazardous substance is required under CERCLA if the diameter of the pieces of the solid metal released is larger than 100 micrometers (0.004 inches).

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- C.I. 77180
- CADMIUM
- CADMIUM DUST (AS CD)
- CADMIUM METAL: CADMIUM

**CAMEO** *Chemicals***Chemical Datasheet****CHROMIUM****Chemical Identifiers**

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
7440-47-3	1759	Corrosive	none
NIOSH Pocket Guide Chromium metal		International Chem Safety Card CHROMIUM	

NFPA 704

data unavailable

General Description

PHYSICAL DESCRIPTION: Very hard gray solid with a metallic luster. (NTP, 1992)

Hazards**Reactivity Alerts**

Pyrophoric

Air & Water Reactions

May be pyrophoric, as dust. Insoluble in water.

Fire Hazard

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. Some are oxidizers and may ignite combustibles (wood, paper, oil, clothing, etc.). Corrosives in contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. For electric vehicles or equipment, ERG Guide 147 (lithium ion or sodium ion batteries) or ERG Guide 138 (sodium batteries) should also be consulted. (ERG, 2024)

Health Hazard

Excerpt from NIOSH Pocket Guide for Chromium metal:

Exposure Routes: Inhalation, ingestion, skin and/or eye contact

Symptoms: Irritation eyes, skin; lung fibrosis (histologic)

Target Organs: Eyes, skin, respiratory system (NIOSH, 2024)

Reactivity Profile

CHROMIUM reacts violently with NH_4NO_3 , N_2O_2 , Li, NO, KClO_3 , SO_2 (NTP, 1992). Metal dusts when suspended in atmospheres of carbon dioxide may ignite and explode.

Belongs to the Following Reactive Group(s)

- Metals, Elemental and Powder, Active

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

SMALL FIRE: Dry chemical, CO_2 or water spray.

LARGE FIRE: Dry chemical, CO_2 , alcohol-resistant foam or water spray. If it can be done safely, move undamaged containers away from the area around the fire. Dike runoff from fire control for later disposal.

FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. (ERG, 2024)

Non-Fire Response

SMALL SPILLS AND LEAKAGE: If you spill this chemical, dampen the solid spill material with 5% ammonium hydroxide, then transfer the dampened material to a suitable container. Use absorbent paper dampened with 5% ammonium hydroxide to pick up any remaining material. Your contaminated clothing and the absorbent paper should be sealed in a vapor-tight plastic bag for eventual disposal. Wash all contaminated surfaces with 5% ammonium hydroxide followed by washing with a strong soap and water solution. Do not reenter the contaminated area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.

STORAGE PRECAUTIONS: You should store this material in a refrigerator. (NTP, 1992)

Protective Clothing

Excerpt from NIOSH Pocket Guide for Chromium metal:

Skin: No recommendation is made specifying the need for personal protective equipment for the body.

Eyes: No recommendation is made specifying the need for eye protection.

Wash skin: No recommendation is made specifying the need for washing the substance from the skin (either immediately or at the end of the work shift).

Remove: No recommendation is made specifying the need for removing clothing that becomes wet or contaminated.

Change: No recommendation is made specifying the need for the worker to change clothing after the workshift. (NIOSH, 2024)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: Some heavy metals are VERY TOXIC POISONS, especially if their salts are very soluble in water (e.g., lead, chromium, mercury, bismuth, osmium, and arsenic). IMMEDIATELY call a hospital or poison control center and locate activated charcoal, egg whites, or milk in case the medical advisor recommends administering one of them. Also locate Ipecac syrup or a glass of salt water in case the medical advisor recommends inducing vomiting. Usually, this is NOT RECOMMENDED outside of a physician's care. If advice from a physician is not readily available and the victim is conscious and not convulsing, give the victim a glass of activated charcoal slurry in water or, if this is not available, a glass of milk, or beaten egg whites and IMMEDIATELY transport victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, assure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital.

OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

Physical Properties

Chemical Formula: Cr

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: 3452°F (NTP, 1992)**Vapor Pressure:** 1 mmHg at 2941°F (NTP, 1992)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 7.2 (NTP, 1992) - Denser than water; will sink**Boiling Point:** 4788°F at 760 mmHg (NTP, 1992)**Molecular Weight:** 52 (NTP, 1992)**Water Solubility:** Insoluble (NIOSH, 2024)

Ionization Energy/Potential: data unavailable

IDLH: 250 mg Cr/m3 (NIOSH, 2024)**AEGLs (Acute Exposure Guideline Levels)**

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Chromium (7440-47-3)	1.5 mg/m3	17 mg/m3	99 mg/m3

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Chromium ††	7440-47-3			5000 pounds	313		
Chromium Compounds	N090			&	313		

†† indicates that no reporting of releases of this CERCLA hazardous substance is required under CERCLA if the diameter of the pieces of the solid metal released is larger than 100 micrometers (0.004 inches).

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- ALPASTE RRA 030
- ALPASTE RRA 050
- CHROME
- CHROMIUM
- CHROMIUM ELEMENT
- CHROMIUM FULLERIDE (CRC20)
- CHROMIUM METAL

**CAMEO** *Chemicals***Chemical Datasheet****COPPER****Chemical Identifiers**

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
7440-50-8	3089 (powder)	Flammable Solid	none
NIOSH Pocket Guide Copper (dusts and mists, as Cu)		International Chem Safety Card COPPER	

NFPA 704

data unavailable

General Description

Reddish lustrous malleable odorless metallic solid.

Hazards**Reactivity Alerts**

none

Air & Water Reactions

Solid pieces are very slowly oxidized by air to give a green basic carbonate. Solid pieces become covered by a black oxide when heated in air. Insoluble in water.

Fire Hazard

Excerpt from ERG Guide 170 [Metals (Powders, Dusts, Shavings, Borings, Turnings, or Cuttings, etc.)]:

May react violently or explosively on contact with water. Some are transported in flammable liquids. May be ignited by friction, heat, sparks or flames. Some of these materials will burn with intense heat. Dusts or fumes may form explosive mixtures in air. Containers may explode when heated. May re-ignite after fire is extinguished. (ERG, 2024)

Health Hazard

Excerpt from NIOSH Pocket Guide for Copper (dusts and mists, as Cu):

Exposure Routes: Inhalation, ingestion, skin and/or eye contact

Symptoms: Irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; In Animals: lung, liver, kidney damage; anemia

Target Organs: Eyes, skin, respiratory system, liver, kidneys (increased risk with Wilson's disease) (NIOSH, 2024)

Reactivity Profile

COPPER combines violently with chlorine trifluoride in the presence of carbon [Mellor 2, Supp. 1, 1956]. Is oxidized by sodium peroxide with incandescence [Mellor 2:490-93, 1946-1947]. Forms an unstable acetylide when acetylene is passed over samples that have been heated enough to form an oxide coating. Reacts more rapidly in powdered or granular form. Subject to explosive reaction then mixed in finely divided form with finely divided bromates chlorates and iodates of barium, calcium, magnesium, potassium, sodium, or zinc; these reactions are initiated by heat, percussion, and occasionally light friction [Mellor 2:310, 1946-1947]. A solution of sodium azide in copper pipe with lead joints formed copper azide and lead azide, both of these compounds can detonate [Klotz, 1973].

Belongs to the Following Reactive Group(s)

- Metals, Less Reactive

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 170 [Metals (Powders, Dusts, Shavings, Borings, Turnings, or Cuttings, etc.)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

LARGE SPILL: Consider initial downwind evacuation for at least 50 meters (160 feet).

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 170 [Metals (Powders, Dusts, Shavings, Borings, Turnings, or Cuttings, etc.)]:

DO NOT USE WATER, FOAM OR CO₂. Dousing metallic fires with water will generate hydrogen gas, an extremely dangerous explosion hazard, particularly if fire is in a confined environment (i.e., building, cargo hold, etc.). Use DRY sand, graphite powder, dry sodium chloride-based extinguishers, or class D extinguishers. Confining and smothering metal fires is preferable rather than applying water. If it can be done safely, move undamaged containers away from the area around the fire.

FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 170 [Metals (Powders, Dusts, Shavings, Borings, Turnings, or Cuttings, etc.)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area. Do not touch or walk

through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. (ERG, 2024)

Protective Clothing

Excerpt from NIOSH Pocket Guide for Copper (dusts and mists, as Cu):

Skin: PREVENT SKIN CONTACT - Wear appropriate personal protective clothing to prevent skin contact.

Eyes: PREVENT EYE CONTACT - Wear appropriate eye protection to prevent eye contact.

Wash skin: WHEN CONTAMINATED - The worker should immediately wash the skin when it becomes contaminated.

Remove: WHEN WET OR CONTAMINATED - Work clothing that becomes wet or significantly contaminated should be removed and replaced.

Change: DAILY - Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises. (NIOSH, 2024)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

Excerpt from NIOSH Pocket Guide for Copper (dusts and mists, as Cu):

Eye: IRRIGATE IMMEDIATELY - If this chemical contacts the eyes, immediately wash (irrigate) the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately.

Skin: SOAP WASH PROMPTLY - If this chemical contacts the skin, promptly wash the contaminated skin with soap and water. If this chemical penetrates the clothing, promptly remove the clothing and wash the skin with soap and water. Get medical attention promptly.

Breathing: RESPIRATORY SUPPORT - If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

Swallow: MEDICAL ATTENTION IMMEDIATELY - If this chemical has been swallowed, get medical attention immediately. (NIOSH, 2024)

Physical Properties

Chemical Formula: Cu

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: 1981°F (NIOSH, 2024)

Vapor Pressure: 0 mmHg (approx) (NIOSH, 2024)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 8.94 (NIOSH, 2024) - Denser than water; will sink

Boiling Point: 4703°F at 760 mmHg (NIOSH, 2024)

Molecular Weight: 63.5 (NIOSH, 2024)

Water Solubility: Insoluble (NIOSH, 2024)

Ionization Energy/Potential: data unavailable

IDLH: 100 mg Cu/m3 (NIOSH, 2024)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Copper (7440-50-8)	3 mg/m3	33 mg/m3	200 mg/m3

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Copper ††	7440-50-8			5000 pounds	313		
Copper Compounds	N100			&	313		

†† indicates that no reporting of releases of this CERCLA hazardous substance is required under CERCLA if the diameter of the pieces of the solid metal released is larger than 100 micrometers (0.004 inches).

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

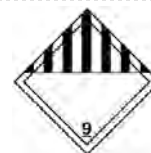
No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- COPPER
- COPPER COMPOUNDS
- COPPER METAL DUSTS
- COPPER METAL FUMES

**CAMEO** *Chemicals***Chemical Datasheet****BENZO[A]PYRENE****Chemical Identifiers****CAS Number**

50-32-8

UN/NA Number

3077

DOT Hazard Label

Class 9

USCG CHRIS Code

none

NIOSH Pocket Guide

none

International Chem Safety Card

BENZO(a)PYRENE

NFPA 704

data unavailable

General Description

A liquid. Presents a threat to the environment. Immediate steps should be taken to limit its spread to the environment. Easily penetrates the soil and contaminates groundwater or nearby waterways.

Hazards**Reactivity Alerts**

none

Air & Water Reactions

Insoluble in water.

Fire Hazard

Literature sources indicate that this chemical is nonflammable. (NTP, 1992)

Health Hazard

SYMPTOMS: Symptoms of exposure to this compound include mucous membrane irritation, dermatitis, bronchitis, cough, dyspnea, conjunctivitis, photosensitization, pulmonary edema, reproductive effects and leukemia. Contact with the skin may result in erythema, pigmentation, desquamation, formation of verrucae and infiltration. It may also cause keratoses which are relatively small, heaped-up, scaling, brown plaques on the skin, some of which may be fissured and may itch. Exposure to this type of compound may cause reddening and squamous eczema of the lid margins with only small erosion of the corneal epithelium and superficial changes in the stroma which disappear a month following exposure. Repeated exposure may cause sunlight to have a more severe effects on a person's skin and also an allergic skin rash. Aplastic anemia may also occur. Chronic exposure to the fumes and dust of this type of compound can cause

discoloration of the cornea and epithelioma of the lid margin.

ACUTE/CHRONIC HAZARDS: This compound may be harmful by ingestion or inhalation. It may cause irritation. When heated to decomposition it emits acrid smoke and toxic fumes of carbon monoxide and carbon dioxide. (NTP, 1992)

Reactivity Profile

BENZO[A]PYRENE undergoes photo-oxidation after irradiation in indoor sunlight or by fluorescent light in organic solvents. Incompatible with strong oxidizing agents including various electrophiles, peroxides, nitrogen oxides and sulfur oxides. Oxidized by ozone, chromic acid and chlorinating agents. Readily undergoes nitration and halogenation. Hydrogenation occurs with platinum oxide (NTP, 1992).

Belongs to the Following Reactive Group(s)

- Hydrocarbons, Aromatic

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 171 [Substances (Low to Moderate Hazard)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 171 [Substances (Low to Moderate Hazard)]:

CAUTION: Fire involving Safety devices (UN3268) and Fire suppressant dispersing devices (UN3559) may have a delayed activation and a risk of hazardous projectiles. Extinguish the fire at a safe distance.

SMALL FIRE: Dry chemical, CO₂, water spray or regular foam.

LARGE FIRE: Water spray, fog or regular foam. Do not scatter spilled material with high-pressure water streams. If it can be done safely, move undamaged containers away from the area around the fire. Dike runoff from fire control for later disposal.

FIRE INVOLVING TANKS: Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 171 [Substances (Low to Moderate Hazard)]:

Do not touch or walk through spilled material. Stop leak if you can do it without risk. Prevent dust cloud. For Asbestos, avoid inhalation of dust. Cover spill with plastic sheet or tarp to minimize spreading. Do not clean up or dispose of, except under supervision of a specialist.

SMALL DRY SPILL: With clean shovel, place material into clean, dry container and cover loosely; move containers from spill area.

SMALL SPILL: Pick up with sand or other non-combustible absorbent material and place into containers for later disposal.

LARGE SPILL: Dike far ahead of liquid spill for later disposal. Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent entry into waterways, sewers, basements or confined areas. (ERG, 2024)

Protective Clothing

Excerpt from ERG Guide 171 [Substances (Low to Moderate Hazard)]:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing provides thermal protection but only limited chemical protection. (ERG, 2024)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. **IMMEDIATELY** transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: **IMMEDIATELY** flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. **IMMEDIATELY** call a hospital or poison control center even if no symptoms (such as redness or irritation) develop. **IMMEDIATELY** transport the victim to a hospital for treatment after washing the affected areas.

INHALATION: **IMMEDIATELY** leave the contaminated area; take deep breaths of fresh air. **IMMEDIATELY** call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: **DO NOT INDUCE VOMITING.** If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and **IMMEDIATELY** call a hospital or poison control center. Be prepared to transport the victim to a hospital if advised by a physician. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. **DO NOT INDUCE VOMITING.** **IMMEDIATELY** transport the victim to a hospital.

OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

Physical Properties

Chemical Formula: C20H12

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: 349.7 to 351.5°F (NTP, 1992)**Vapor Pressure:** 5.49e-09 mmHg at 77°F (NTP, 1992)**Vapor Density (Relative to Air):** 8.7 (NTP, 1992) - Heavier than air; will sink**Specific Gravity:** greater than 1 (NTP, 1992)**Boiling Point:** 887°F at 760 mmHg (NTP, 1992)**Molecular Weight:** 252.32 (NTP, 1992)**Water Solubility:** less than 1 mg/mL at 63°F (NTP, 1992)

Ionization Energy/Potential: data unavailable

IDLH: data unavailable

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Benzo(a)pyrene; (Coal tar pitch volatiles) (50-32-8)	0.6 mg/m3	120 mg/m3	700 mg/m3

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Benzo[a]pyrene	50-32-8			1 pound	313+	U022	
Polycyclic aromatic compounds (includes only 25 chemicals)	N590				313		

313+ indicates that this is a member of the EPCRA Section 313 PAC (polycyclic aromatic compounds) category.

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- B(A)P
- BAP
- BENZ(A)PYRENE
- 3,4-BENZ(A)PYRENE
- BENZO(D,E,F)CHRYSENE
- BENZOPYRENE
- 1,2-BENZOPYRENE
- 3,4-BENZOPYRENE
- 6,7-BENZOPYRENE
- BENZO[A]PYRENE
- BENZO[D,E,F]CHRYSENE
- 3,4-BENZPYRENE (CARCINOGEN)
- 3,4-BENZPYRENE
- 4,5-BENZPYRENE
- 3,4-BENZYL PYRENE
- 3,4-BENZYPYRENE
- BENZ[A]PYRENE
- 3,4-BENZ[A]PYRENE
- BP
- 3,4-BP

**CAMEO** *Chemicals***Chemical Datasheet****FUEL OIL, [DIESEL]****Chemical Identifiers**

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
68334-30-5	1993 (domestic)	Flammable Liquid	ODS
68476-30-2	1202 (international)		
68476-31-3			
68476-34-6			
77650-28-3			

NIOSH Pocket Guide

none

International Chem Safety Card

DIESEL FUEL No. 2

NFPA 704

Diamond	Hazard	Value	Description
2 1 0	 Health	1	Can cause significant irritation.
	 Flammability	2	Must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.
	 Instability	0	Normally stable, even under fire conditions.
	 Special		

(NFPA, 2010)

General Description

A straw yellow to dark colored liquid with a petroleum-like odor. Flash point below 141°F. Less dense than water and insoluble in water. Hence floats on water. Vapors heavier than air.

Hazards**Reactivity Alerts**

Highly Flammable

Air & Water Reactions

Flammable. Insoluble in water.

Fire Hazard

Combustible. (USCG, 1999)

Health Hazard

LIQUID: Irritating to skin and eyes. Harmful if swallowed. (USCG, 1999)

Reactivity Profile

Saturated aliphatic hydrocarbons, which are contained in FUEL OIL, [DIESEL], may be incompatible with strong oxidizing agents like nitric acid. Charring of the hydrocarbon may occur followed by ignition of unreacted hydrocarbon and other nearby combustibles. In other settings, aliphatic saturated hydrocarbons are mostly unreactive. They are not affected by aqueous solutions of acids, alkalis, most oxidizing agents, and most reducing agents. When heated sufficiently or when ignited in the presence of air, oxygen or strong oxidizing agents, they burn exothermically to produce carbon dioxide and water. May be ignited by strong oxidizers.

Belongs to the Following Reactive Group(s)

- Hydrocarbons, Aliphatic Saturated

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 128 [Flammable Liquids (Water-Immiscible)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area for at least 50 meters (150 feet) in all directions.

LARGE SPILL: Consider initial downwind evacuation for at least 300 meters (1000 feet).

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 128 [Flammable Liquids (Water-Immiscible)]:

CAUTION: The majority of these products have a very low flash point. Use of water spray when fighting fire may be inefficient. CAUTION: For mixtures containing alcohol or polar solvent, alcohol-resistant foam may be more effective.

SMALL FIRE: Dry chemical, CO₂, water spray or regular foam. If regular foam is ineffective or unavailable, use alcohol-resistant foam.

LARGE FIRE: Water spray, fog or regular foam. If regular foam is ineffective or unavailable, use alcohol-resistant foam. Avoid aiming straight or solid streams directly onto the product. If it can be done safely, move undamaged containers away from the area around the fire.

FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. For petroleum crude oil, do not spray water directly into a breached tank car. This can lead to a dangerous boil over. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 128 [Flammable Liquids (Water-Immiscible)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A vapor-suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean, non-sparking tools to collect absorbed material.

LARGE SPILL: Dike far ahead of liquid spill for later disposal. Water spray may reduce vapor, but may not prevent ignition in closed spaces. (ERG, 2024)

Protective Clothing

Excerpt from ERG Guide 128 [Flammable Liquids (Water-Immiscible)]:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing provides thermal protection but only limited chemical protection. (ERG, 2024)

DuPont Tychem® Suit Fabrics

Normalized Breakthrough Times (in Minutes)

Chemical	CAS Number	State	QS	QC	SL	C3	TF	TP	RC	TK	RF
Diesel fuel	68334-30-5	Liquid				199	>480	>480	>480	>480	>480
Fuel-oil no 2	68476-30-2	Liquid		imm	>480				>480		

> indicates greater than.

"imm" indicates immediate; having a normalized breakthrough time of 10 minutes or less.

Special Warning from DuPont: Tychem® and Tyvek® fabrics should not be used around heat, flames, sparks or in potentially flammable or explosive environments. Only...

(DuPont, 2024)

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown

atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: DO NOT INDUCE VOMITING. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and **IMMEDIATELY** call a hospital or poison control center. Be prepared to transport the victim to a hospital if advised by a physician. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. **DO NOT INDUCE VOMITING. IMMEDIATELY** transport the victim to a hospital. (NTP, 1992)

Physical Properties

Chemical Formula: data unavailable

Flash Point: 125°F (NTP, 1992)

Lower Explosive Limit (LEL): 1.3 % (NTP, 1992)

Upper Explosive Limit (UEL): 6 % (NTP, 1992)

Autoignition Temperature: 350 to 625°F (USCG, 1999)

Melting Point: 0°F (NTP, 1992)

Vapor Pressure: 2.17 mmHg at 70°F (USCG, 1999)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 0.841 at 60.8°F (USCG, 1999) - Less dense than water; will float

Boiling Point: 540 to 640°F at 760 mmHg (NTP, 1992)

Molecular Weight: data unavailable

Water Solubility: less than 1 mg/mL at 66°F (NTP, 1992)

Ionization Energy/Potential: data unavailable

IDLH: data unavailable

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

Chemical	ERPG-1	ERPG-2	ERPG-3
Diesel Fuel and Other Middle Distillate Fuels (68334-30-5)	300 mg/m3 	1000 mg/m3	Not Established

 indicates that odor should be detectable near ERPG-1.

(AIHA, 2022)

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Diesel fuels; (includes diesel fuel No. 4 (68476-31-3), fuel oil No.2 (68476-30-2), fuel oil residual (68476-33-5) (68334-30-5)	300 mg/m3	1000 mg/m3	6000 mg/m3

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

No regulatory information available.

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- DFM
- DIESEL FUEL
- DIESEL FUEL OIL
- DIESEL OIL, MEDIUM
- FUEL OIL
- FUEL OIL 1-D
- FUEL OIL 2-D
- FUEL OIL, [DIESEL]
- NCI-C54795
- OILS: DIESEL

**CAMEO** *Chemicals***Chemical Datasheet****ETHYLBENZENE****Chemical Identifiers****CAS Number**100-41-4 **UN/NA Number**

1175

DOT Hazard Label

Flammable Liquid

USCG CHRIS Code

ETB

NIOSH Pocket Guide

Ethyl benzene

International Chem Safety Card

ETHYLBENZENE

NFPA 704

Diamond	Hazard	Value	Description
3 2 0	 Health	2	Can cause temporary incapacitation or residual injury.
	 Flammability	3	Can be ignited under almost all ambient temperature conditions.
	 Instability	0	Normally stable, even under fire conditions.
	 Special		

(NFPA, 2010)

General Description

A clear colorless liquid with an aromatic odor. Flash point 59°F. Less dense than water (at 7.2 lb / gal) and insoluble in water. Hence floats on water. Vapors heavier than air. Used as a solvent and to make other chemicals.

Hazards**Reactivity Alerts**

Highly Flammable

Air & Water Reactions

Highly flammable. Insoluble in water.

Fire Hazard

Special Hazards of Combustion Products: Irritating vapors are generated when heated.

Behavior in Fire: Vapor is heavier than air and may travel considerable distance to the source of ignition and flash back. (USCG, 1999)

Health Hazard

Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters. (USCG, 1999)

Reactivity Profile

ETHYLBENZENE can react vigorously with strong oxidizing materials (NTP, 1992).

Belongs to the Following Reactive Group(s)

- Hydrocarbons, Aromatic

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 130 [Flammable Liquids (Water-Immiscible / Noxious)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area for at least 50 meters (150 feet) in all directions.

LARGE SPILL: Consider initial downwind evacuation for at least 300 meters (1000 feet).

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 130 [Flammable Liquids (Water-Immiscible / Noxious)]:

CAUTION: The majority of these products have a very low flash point. Use of water spray when fighting fire may be inefficient.

SMALL FIRE: Dry chemical, CO₂, water spray or regular foam. If regular foam is ineffective or unavailable, use alcohol-resistant foam.

LARGE FIRE: Water spray, fog or regular foam. If regular foam is ineffective or unavailable, use alcohol-resistant foam. Avoid aiming straight or solid streams directly onto the product. If it can be done safely, move undamaged containers away from the area around the fire.

FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 130 [Flammable Liquids (Water-Immiscible / Noxious)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A vapor-suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean, non-sparking tools to collect absorbed material.

LARGE SPILL: Dike far ahead of liquid spill for later disposal. Water spray may reduce vapor, but may not prevent ignition in closed spaces. (ERG, 2024)

Protective Clothing

Excerpt from NIOSH Pocket Guide for Ethyl benzene:

Skin: PREVENT SKIN CONTACT - Wear appropriate personal protective clothing to prevent skin contact.

Eyes: PREVENT EYE CONTACT - Wear appropriate eye protection to prevent eye contact.

Wash skin: WHEN CONTAMINATED - The worker should immediately wash the skin when it becomes contaminated.

Remove: WHEN WET (FLAMMABLE) - Work clothing that becomes wet should be immediately removed due to its flammability hazard (i.e., for liquids with a flash point <100°F).

Change: No recommendation is made specifying the need for the worker to change clothing after the workshift. (NIOSH, 2024)

DuPont Tychem® Suit Fabrics

Normalized Breakthrough Times (in Minutes)

Chemical	CAS Number	State	QS	QC	SL	C3	TF	TP	RC	TK	RF
Ethyl benzene	100-41-4	Liquid			imm	>480	>480	>480	>480	>480	>480
Phenyl ethane	100-41-4	Liquid			imm	>480	>480	>480	>480	>480	>480

> indicates greater than.

"imm" indicates immediate; having a normalized breakthrough time of 10 minutes or less.

Special Warning from DuPont: Tychem® and Tyvek® fabrics should not be used around heat, flames, sparks or in potentially flammable or explosive environments. Only...

(DuPont, 2024)

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop, call a physician and be

prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: DO NOT INDUCE VOMITING. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and **IMMEDIATELY** call a hospital or poison control center. Be prepared to transport the victim to a hospital if advised by a physician. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. **DO NOT INDUCE VOMITING. IMMEDIATELY** transport the victim to a hospital. (NTP, 1992)

Physical Properties

Chemical Formula: C₈H₁₀

Flash Point: 59°F (NTP, 1992)

Lower Explosive Limit (LEL): 1.2 % (NTP, 1992)

Upper Explosive Limit (UEL): 6.8 % (NTP, 1992)

Autoignition Temperature: 860°F (USCG, 1999)

Melting Point: -139°F (NTP, 1992)

Vapor Pressure: 10 mmHg at 85.1°F ; 5 mmHg at 57.0°F; 760 mmHg at 277.2°F (NTP, 1992)

Vapor Density (Relative to Air): 3.66 (NTP, 1992) - Heavier than air; will sink

Specific Gravity: 0.867 at 68°F (USCG, 1999) - Less dense than water; will float

Boiling Point: 277.2°F at 760 mmHg (NTP, 1992)

Molecular Weight: 106.16 (NTP, 1992)

Water Solubility: less than 1 mg/mL at 73°F (NTP, 1992)

Ionization Energy/Potential: 8.76 eV (NIOSH, 2024)

IDLH: 800 ppm ; Based on 10% of the lower explosive limit. (NIOSH, 2024)

AEGLs (Acute Exposure Guideline Levels)

Interim AEGLs for Ethyl benzene (100-41-4)

Exposure Period	AEGL-1	AEGL-2	AEGL-3
10 minutes	33 ppm	2900 ppm	4700 ppm
30 minutes	33 ppm	1600 ppm	2600 ppm
60 minutes	33 ppm	1100 ppm	1800 ppm
4 hours	33 ppm	660 ppm	1000 ppm
8 hours	33 ppm	580 ppm	910 ppm

(NAC/NRC, 2024)

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3	
Ethyl benzene (100-41-4)	33 ppm	1100 ppm 🔥	1800 ppm 🔥	LEL = 8000 ppm

 indicates value is 10-49% of LEL.

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Ethylbenzene	100-41-4			1000 pounds	313		

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- ALPHA-METHYLTOLUENE
- EB
- ETHYL BENZENE
- ETHYLBENZENE
- ETHYLBENZOL
- NCI C56393
- PHENYLETHANE

**CAMEO** *Chemicals***Chemical Datasheet****GASOLINE****Chemical Identifiers**

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
8006-61-9 86290-81-5	1203	Flammable Liquid	GAT

NIOSH Pocket Guide
Gasoline

International Chem Safety Card
GASOLINE

NFPA 704

Diamond	Hazard	Value	Description
3 1 0	 Health	1	Can cause significant irritation.
	 Flammability	3	Can be ignited under almost all ambient temperature conditions.
	 Instability	0	Normally stable, even under fire conditions.
	 Special		

(NFPA, 2010)

General Description

A clear colorless to amber colored, volatile liquid with a petroleum-like odor. Flash point below 0°F. Less dense than water and insoluble in water. Hence floats on water. Vapors heavier than air. Leaked vapors may travel to a source of ignition and then flash back to the source.

Hazards**Reactivity Alerts**

Highly Flammable

Air & Water Reactions

Highly flammable.

Fire Hazard

Special Hazards of Combustion Products: None

Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. (USCG, 1999)

Health Hazard

Irritation of mucous membranes and stimulation followed by depression of central nervous system. Breathing of vapor may also cause dizziness, headache, and incoordination or, in more severe cases, anesthesia, coma, and respiratory arrest. If liquid enters lungs, it will cause severe irritation, coughing, gagging, pulmonary edema, and, later, signs of bronchopneumonia and pneumonitis. Swallowing may cause irregular heartbeat. (USCG, 1999)

Reactivity Profile

GASOLINE may be incompatible with strong oxidizing agents such as nitric acid, peroxides, and perchlorates. Charring may occur followed by ignition of unreacted hydrocarbon and other nearby combustibles. In other settings, mostly unreactive. Not affected by aqueous solutions of acids, alkalis, most oxidizing agents, and most reducing agents. When heated sufficiently or when ignited in the presence of air, oxygen or strong oxidizing agents, burns exothermically to produce carbon dioxide and water.

Belongs to the Following Reactive Group(s)

- Hydrocarbons, Aliphatic Saturated

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 128 [Flammable Liquids (Water-Immiscible)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area for at least 50 meters (150 feet) in all directions.

LARGE SPILL: Consider initial downwind evacuation for at least 300 meters (1000 feet).

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 128 [Flammable Liquids (Water-Immiscible)]:

CAUTION: The majority of these products have a very low flash point. Use of water spray when fighting fire may be inefficient. CAUTION: For mixtures containing alcohol or polar solvent, alcohol-resistant foam may be more effective.

SMALL FIRE: Dry chemical, CO₂, water spray or regular foam. If regular foam is ineffective or unavailable, use alcohol-resistant foam.

LARGE FIRE: Water spray, fog or regular foam. If regular foam is ineffective or unavailable, use alcohol-resistant foam. Avoid aiming straight or solid streams directly onto the product. If it can be done safely, move undamaged

containers away from the area around the fire.

FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. For petroleum crude oil, do not spray water directly into a breached tank car. This can lead to a dangerous boil over. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 128 [Flammable Liquids (Water-Immiscible)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A vapor-suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean, non-sparking tools to collect absorbed material.

LARGE SPILL: Dike far ahead of liquid spill for later disposal. Water spray may reduce vapor, but may not prevent ignition in closed spaces. (ERG, 2024)

Protective Clothing

Excerpt from NIOSH Pocket Guide for Gasoline:

Skin: PREVENT SKIN CONTACT - Wear appropriate personal protective clothing to prevent skin contact.

Eyes: PREVENT EYE CONTACT - Wear appropriate eye protection to prevent eye contact.

Wash skin: WHEN CONTAMINATED - The worker should immediately wash the skin when it becomes contaminated.

Remove: WHEN WET (FLAMMABLE) - Work clothing that becomes wet should be immediately removed due to its flammability hazard (i.e., for liquids with a flash point <100°F).

Change: No recommendation is made specifying the need for the worker to change clothing after the workshift.

Provide:

- **EYEWASH** - Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substances; this is irrespective of the recommendation involving the wearing of eye protection.
- **QUICK DRENCH** - Facilities for quickly drenching the body should be provided within the immediate work area for emergency use where there is a possibility of exposure. [Note: It is intended that these facilities provide a sufficient quantity or flow of water to quickly remove the substance from any body areas likely to be exposed. The actual determination of what constitutes an adequate quick drench facility depends on the specific circumstances. In certain instances, a deluge shower should be readily available, whereas in others, the availability of water from a sink or hose could be considered adequate.] (NIOSH, 2024)

DuPont Tychem® Suit Fabrics

Normalized Breakthrough Times (in Minutes)

Chemical	CAS Number	State	QS	QC	SL	C3	TF	TP	RC	TK	RF
Gasoline, unleaded	86290-81-5	Liquid			imm	>480	>480	>480	>480	>480	>480

> indicates greater than.

"imm" indicates immediate; having a normalized breakthrough time of 10 minutes or less.

Special Warning from DuPont: Tychem® and Tyvek® fabrics should not be used around heat, flames, sparks or in potentially flammable or explosive environments. Only...

(DuPont, 2024)

First Aid

Excerpt from NIOSH Pocket Guide for Gasoline:

Eye: IRRIGATE IMMEDIATELY - If this chemical contacts the eyes, immediately wash (irrigate) the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately.

Skin: SOAP FLUSH IMMEDIATELY - If this chemical contacts the skin, immediately flush the contaminated skin with soap and water. If this chemical penetrates the clothing, immediately remove the clothing and flush the skin with water. If irritation persists after washing, get medical attention.

Breathing: RESPIRATORY SUPPORT - If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

Swallow: MEDICAL ATTENTION IMMEDIATELY - If this chemical has been swallowed, get medical attention immediately. (NIOSH, 2024)

Physical Properties

Chemical Formula: data unavailable

Flash Point: -36°F (USCG, 1999)

Lower Explosive Limit (LEL): 1.4 % (USCG, 1999)

Upper Explosive Limit (UEL): 7.4 % (USCG, 1999)

Autoignition Temperature: 853°F (USCG, 1999)

Melting Point: data unavailable

Vapor Pressure: 382.58 mmHg (USCG, 1999)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 0.7321 at 68°F (USCG, 1999) - Less dense than water; will float

Boiling Point: 140 to 390°F at 760 mmHg (USCG, 1999)

Molecular Weight: 110 (approx) (NIOSH, 2024)

Water Solubility: Insoluble (NIOSH, 2024)

Ionization Energy/Potential: data unavailable

IDLH: A potential occupational carcinogen. (NIOSH, 2024)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

Chemical	ERPG-1	ERPG-2	ERPG-3	
Gasoline (86290-81-5)	200 ppm 🌟	1000 ppm	4000 ppm 🔥	LEL = 14000 ppm

🌟 indicates that odor should be detectable near ERPG-1.

🔥 indicates value is 10-49% of LEL.

(AIHA, 2022)

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3	
Gasoline (86290-81-5)	200 ppm	1000 ppm	4000 ppm 🔥	LEL = 13000 ppm

🔥 indicates value is 10-49% of LEL.

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

No regulatory information available.

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

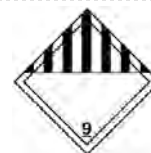
No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- A 76
- A 76 (FUEL)
- AI 3
- AI 93 (FUEL)
- AKVAZIN
- BENZINE (MOTOR FUEL)
- FUELS, GASOLINE
- GASOLINE
- GASOLINE, SYNTHETIC
- GASOLINES: AUTOMOTIVE (<4.23G LEAD/GAL)
- HERBICIDE ES
- INDOLENE
- MOTOR FUEL
- MOTOR SPIRIT
- MOTOR SPIRITS
- NATURAL GAS CONDENSATES, GASOLINE
- NATURAL GASOLINE
- NEFRAS S 150/200
- NEFRAS S 50/170
- PETROL
- PETROL, NATURAL
- PETROL, SYNTHETIC
- SYNFUELS
- SYNTHETIC GASOLINE

**CAMEO** *Chemicals***Chemical Datasheet****LEAD****Chemical Identifiers**

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
7439-92-1	3077 (powder)	Class 9	none
NIOSH Pocket Guide		International Chem Safety Card	
Lead		LEAD	

NFPA 704

data unavailable

General Description

PHYSICAL DESCRIPTION: Soft silver-bluish white to gray metal. (NTP, 1992)

Hazards**Reactivity Alerts**

none

Air & Water Reactions

Insoluble in water.

Fire Hazard

Flash point data for this compound are not available, however, it is probably non-combustible. (NTP, 1992)

Health Hazard

Excerpt from NIOSH Pocket Guide for Lead:

Exposure Routes: Inhalation, ingestion, skin and/or eye contact

Symptoms: Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension

Target Organs: Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue (NIOSH, 2024)

Reactivity Profile

In the presence of carbon, the combination of chlorine trifluoride with aluminum, copper, lead, magnesium, silver, tin, or zinc results in a violent reaction [Mellor 2, Supp. 1: 1956]. A solution of sodium azide in copper pipe with lead joints formed copper and lead azide, both are detonating compounds [Klotz 1973]. Sodium acetylide becomes pyrophoric when mixed with metals like lead. Mixtures of trioxane with 60% hydrogen peroxide in contact with metallic lead when heated detonated. Lead containing rubber ignited in a nitric acid atmosphere. Lead is incompatible with strong oxidants such as: ammonium nitrate, chlorine trifluoride, hydrogen peroxide, etc.

Belongs to the Following Reactive Group(s)

- Metals, Less Reactive

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 171 [Substances (Low to Moderate Hazard)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Fires involving this material can be controlled with a dry chemical, carbon dioxide, foam, or Halon extinguisher. (NTP, 1992)

Non-Fire Response

STORAGE PRECAUTIONS: You should store this chemical under refrigerated temperatures, and keep it away from oxidizing materials. (NTP, 1992)

Protective Clothing

Excerpt from NIOSH Pocket Guide for Lead:

Skin: PREVENT SKIN CONTACT - Wear appropriate personal protective clothing to prevent skin contact.

Eyes: PREVENT EYE CONTACT - Wear appropriate eye protection to prevent eye contact.

Wash skin: DAILY - The worker should wash daily at the end of each work shift, and prior to eating, drinking, smoking, etc.

Remove: WHEN WET OR CONTAMINATED - Work clothing that becomes wet or significantly contaminated should be removed and replaced.

Change: DAILY - Workers whose clothing may have become contaminated should change into uncontaminated

clothing before leaving the work premises. (NIOSH, 2024)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. **IMMEDIATELY** transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: **IMMEDIATELY** flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, **IMMEDIATELY** call a physician and be prepared to transport the victim to a hospital for treatment.

INHALATION: **IMMEDIATELY** leave the contaminated area; take deep breaths of fresh air. **IMMEDIATELY** call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: Some heavy metals are **VERY TOXIC POISONS**, especially if their salts are very soluble in water (e.g., lead, chromium, mercury, bismuth, osmium, and arsenic). **IMMEDIATELY** call a hospital or poison control center and locate activated charcoal, egg whites, or milk in case the medical advisor recommends administering one of them. Also locate Ipecac syrup or a glass of salt water in case the medical advisor recommends inducing vomiting. Usually, this is **NOT RECOMMENDED** outside of a physician's care. If advice from a physician is not readily available and the victim is conscious and not convulsing, give the victim a glass of activated charcoal slurry in water or, if this is not available, a glass of milk, or beaten egg whites and **IMMEDIATELY** transport victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, assure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. **DO NOT INDUCE VOMITING.** **IMMEDIATELY** transport the victim to a hospital.

OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

Physical Properties

Chemical Formula: Pb

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: 621.5°F (NTP, 1992)

Vapor Pressure: 1.77 mmHg (NTP, 1992)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 11.3437 at 61°F (NTP, 1992) - Denser than water; will sink

Boiling Point: 3164°F at 760 mmHg (NTP, 1992)

Molecular Weight: 207.19 (NTP, 1992)

Water Solubility: Insoluble (NTP, 1992)

Ionization Energy/Potential: data unavailable

IDLH: 100 mg Pb/m3 (NIOSH, 2024)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Lead (7439-92-1)	0.15 mg/m3	120 mg/m3	700 mg/m3

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Lead ††	7439-92-1			10 pounds	313		
Lead Compounds	N420			&	313		

†† indicates that no reporting of releases of this CERCLA hazardous substance is required under CERCLA if the diameter of the pieces of the solid metal released is larger than 100 micrometers (0.004 inches).

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- C.I. 77575
- C.I. PIGMENT METAL 4
- KS-4
- LEAD
- LEAD ELEMENT
- LEAD FLAKE
- LEAD METAL
- LEAD S 2
- LEAD SZ

- PB-S 100
- PLUMBUM
- SSO 1

**CAMEO** *Chemicals***Chemical Datasheet****METHYL ETHYL KETONE****Chemical Identifiers****CAS Number**78-93-3 **UN/NA Number**

1193

DOT Hazard Label

Flammable Liquid

USCG CHRIS Code

MEK

NIOSH Pocket Guide

2-Butanone

International Chem Safety Card

METHYL ETHYL KETONE

NFPA 704

Diamond	Hazard	Value	Description
3 1 0	 Health	1	Can cause significant irritation.
	 Flammability	3	Can be ignited under almost all ambient temperature conditions.
	 Instability	0	Normally stable, even under fire conditions.
	 Special		

(NFPA, 2010)

General Description

Colorless fairly volatile liquid with a pleasant pungent odor. Flash point 20°F. Vapors heavier than air. Does not react with water or many common materials. Stable in normal transportation. Irritates the nose, eyes, and throat. Combustion may produce toxic materials. Density 6.7 lb / gal. Used as a solvent, for making other chemicals, and for production of wax from petroleum.

Hazards**Reactivity Alerts**

Highly Flammable

Air & Water Reactions

Highly flammable. Soluble in water.

Fire Hazard

Excerpt from ERG Guide 127 [Flammable Liquids (Water-Miscible)]:

HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames. **CAUTION:** Ethanol (UN1170) can burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.) Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Most vapors are heavier than air. They will spread along the ground and collect in low or confined areas (sewers, basements, tanks, etc.). Vapor explosion hazard indoors, outdoors or in sewers. Those substances designated with a (P) may polymerize explosively when heated or involved in a fire. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Many liquids will float on water. (ERG, 2024)

Health Hazard

Liquid causes eye burn. Vapor irritates eyes, nose, and throat; can cause headache, dizziness, nausea, weakness, and loss of consciousness. (USCG, 1999)

Reactivity Profile

METHYL ETHYL KETONE is explosive in the form of vapor when exposed to heat, flame or sparks. Ignition on contact with potassium tert-butoxide. Reactive with strong oxidizing materials, and will dissolve or soften some plastics. Mixture with 2-propanol will form explosive peroxides during storage. Vigorous reaction with chloroform in the presence of alkali (sodium hydroxide, potassium hydroxide), chlorosulfonic acid, fuming sulfuric acid (oleum) [Lewis, 3rd ed., 1993, p. 855]. Reaction with hydrogen peroxide in the presence of nitric acid forms heat- and shock-sensitive explosive acetone peroxides. [Bjorklund, G. H. et al., Trans. R. Soc. Can, 1950, 44, p. 25].

Belongs to the Following Reactive Group(s)

- Ketones

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 127 [Flammable Liquids (Water-Miscible)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area for at least 50 meters (150 feet) in all directions.

LARGE SPILL: Consider initial downwind evacuation for at least 300 meters (1000 feet).

FIRE: If tank, rail tank car or highway tank is involved in a fire, **ISOLATE** for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 127 [Flammable Liquids (Water-Miscible)]:

CAUTION: The majority of these products have a very low flash point. Use of water spray when fighting fire may be inefficient. **CAUTION:** For fire involving UN1170, UN1987 or UN3475, alcohol-resistant foam should be used. **CAUTION:** Ethanol (UN1170) can burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.).

SMALL FIRE: Dry chemical, CO₂, water spray or alcohol-resistant foam.

LARGE FIRE: Water spray, fog or alcohol-resistant foam. Avoid aiming straight or solid streams directly onto the product. If it can be done safely, move undamaged containers away from the area around the fire.

FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 127 [Flammable Liquids (Water-Miscible)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A vapor-suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean, non-sparking tools to collect absorbed material.

LARGE SPILL: Dike far ahead of liquid spill for later disposal. Water spray may reduce vapor, but may not prevent ignition in closed spaces. (ERG, 2024)

Protective Clothing

Excerpt from NIOSH Pocket Guide for 2-Butanone:

Skin: PREVENT SKIN CONTACT - Wear appropriate personal protective clothing to prevent skin contact.

Eyes: PREVENT EYE CONTACT - Wear appropriate eye protection to prevent eye contact.

Wash skin: WHEN CONTAMINATED - The worker should immediately wash the skin when it becomes contaminated.

Remove: WHEN WET (FLAMMABLE) - Work clothing that becomes wet should be immediately removed due to its flammability hazard (i.e., for liquids with a flash point <100°F).

Change: No recommendation is made specifying the need for the worker to change clothing after the workshift.

Provide: EYEWASH - Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substances; this is irrespective of the recommendation involving the wearing of eye protection. (NIOSH, 2024)

DuPont Tychem® Suit Fabrics

Normalized Breakthrough Times (in Minutes)

Chemical	CAS Number	State	QS	QC	SL	C3	TF	TP	RC	TK	RF
Butanone	78-93-3	Liquid			18	>480	40*/64	40*/64	>480	>480	>480
MEK	78-93-3	Liquid			18	>480	40*/64	40*/64	>480	>480	>480
Methyl ethyl ketone	78-93-3	Liquid			18	>480	40*/64	40*/64	>480	>480	>480

> indicates greater than.

* indicates based on lowest single value.

Special Warning from DuPont: Tychem® and Tyvek® fabrics should not be used around heat, flames, sparks or in potentially flammable or explosive environments. Only...

(DuPont, 2024)

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

Physical Properties

Chemical Formula: C₄H₈O

Flash Point: 26°F (NTP, 1992)

Lower Explosive Limit (LEL): 1.8 % (NTP, 1992)

Upper Explosive Limit (UEL): 10 % (NTP, 1992)

Autoignition Temperature: 961°F (USCG, 1999)

Melting Point: -123.3°F (NTP, 1992)

Vapor Pressure: 77.5 mmHg at 68°F ; 100 mmHg at 77.0°F (NTP, 1992)

Vapor Density (Relative to Air): 2.42 (NTP, 1992) - Heavier than air; will sink

Specific Gravity: 0.806 at 68°F (USCG, 1999) - Less dense than water; will float

Boiling Point: 175.3°F at 760 mmHg (NTP, 1992)

Molecular Weight: 72.11 (NTP, 1992)

Water Solubility: greater than or equal to 100 mg/mL at 66°F (NTP, 1992)

Ionization Energy/Potential: 9.54 eV (NIOSH, 2024)

IDLH: 3000 ppm (NIOSH, 2024)

AEGLs (Acute Exposure Guideline Levels)

Final AEGLs for Methyl ethyl ketone (78-93-3)

Exposure Period	AEGL-1	AEGL-2	AEGL-3
10 minutes	200 ppm	4900 ppm 🔥	10000 ppm 🔥🔥
30 minutes	200 ppm	3400 ppm 🔥	10000 ppm 🔥🔥
60 minutes	200 ppm	2700 ppm 🔥	4000 ppm 🔥
4 hours	200 ppm	1700 ppm	2500 ppm 🔥
8 hours	200 ppm	1700 ppm	2500 ppm 🔥

Lower Explosive Limit (LEL) = 18000 ppm

🔥 indicates value is 10-49% of LEL. Safety consideration against explosions must be taken into account.

🔥🔥 indicates value is 50-99% of LEL. Extreme safety consideration against explosions must be taken into account.
(NAC/NRC, 2024)

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3	
Butanone, 2-; (Methyl ethyl ketone; MEK) (78-93-3)	200 ppm	2700 ppm 🔥	4000 ppm 🔥	LEL = 18000 ppm

🔥 indicates value is 10-49% of LEL.
(DOE, 2024)

Regulatory Information**EPA Consolidated List of Lists**

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Methyl ethyl ketone	78-93-3			5000 pounds		U159	

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- BUTANONE
- 2-BUTANONE
- 3-BUTANONE
- ETHYL METHYL KETONE

- KETONE, ETHYL METHYL
- MEETCO
- MEK
- METHYL ACETONE
- METHYL ETHYL KETONE
- METHYL ETHYL KETONE (MEK)



CAMEO Chemicals



Chemical Datasheet

MERCURY



Chemical Identifiers

CAS Number

7439-97-6

UN/NA Number

2809

DOT Hazard LabelCorrosive
Poison**USCG CHRIS Code**

MCR

NIOSH Pocket Guide

Mercury compounds [except (organo) alkyls] (as Hg)

International Chem Safety Card

MERCURY

NFPA 704

data unavailable

General Description

An odorless, silvery metallic liquid. Insoluble in water. Toxic by ingestion, absorption and inhalation of the fumes. Corrosive to aluminum. Used as a catalyst in instruments, boilers, mirror coatings.

Hazards

Reactivity Alerts

none

Air & Water Reactions

Insoluble in water.

Fire Hazard

Behavior in Fire: Not flammable (USCG, 1999)

Health Hazard

No immediate symptoms. As poisoning becomes established, slight muscular tremor, loss of appetite, nausea, and diarrhea are observed. Psychic, kidney, and cardiovascular disturbances may occur. (USCG, 1999)

Reactivity Profile

MERCURY forms an explosive acetylide when mixed with acetylene. Can form explosive compounds with ammonia (a residue resulting from such a reaction exploded when an attempt was made to clean it off a steel rod [Chem. Eng. News 25:2138. 1947]. Chlorine dioxide (also other oxidants, such as: chlorine, bromine, nitric acid, performic acid),

and mercury explode when mixed [Mellor 2, Supp. 1:381. 1956]. Methyl azide in the presence of mercury is potentially explosive [Can. J. Chem. 41:1048. 1963]. Ground mixtures of sodium carbide and mercury can react vigorously [Mellor 5:848. 1946-47]. Ammonia forms explosive compounds with gold, mercury, or silver. (Eggeman, Tim. "Ammonia". Kirk-Othmer Encyclopedia of Chemical Technology. John Wiley & Sons, Inc. 2001.).

Belongs to the Following Reactive Group(s)

- Metals, Less Reactive

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 172 [Gallium and Mercury]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area for at least 50 meters (150 feet) in all directions.

LARGE SPILL: Consider initial downwind evacuation for at least 100 meters (330 feet).

FIRE: When any large container is involved in a fire, consider initial evacuation for 500 meters (1/3 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 172 [Gallium and Mercury]:

Use extinguishing agent suitable for type of surrounding fire. Do not direct water at the heated metal. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 172 [Gallium and Mercury]:

Do not touch or walk through spilled material. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. Do not use steel or aluminum tools or equipment. Cover with earth, sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain. For mercury, use a mercury spill kit. Mercury spill areas may be subsequently treated with calcium sulphide/calcium sulfide or with sodium thiosulphate/sodium thiosulfate wash to neutralize any residual mercury. (ERG, 2024)

Protective Clothing

Excerpt from NIOSH Pocket Guide for Mercury compounds [except (organo) alkyls] (as Hg):

Skin: PREVENT SKIN CONTACT - Wear appropriate personal protective clothing to prevent skin contact.

Eyes: No recommendation is made specifying the need for eye protection.

Wash skin: WHEN CONTAMINATED - The worker should immediately wash the skin when it becomes contaminated.

Remove: WHEN WET OR CONTAMINATED - Work clothing that becomes wet or significantly contaminated should be removed and replaced.

Change: DAILY - Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises. (NIOSH, 2024)

DuPont Tychem® Suit Fabrics

Normalized Breakthrough Times (in Minutes)

Chemical	CAS Number	State	QS	QC	SL	C3	TF	TP	RC	TK	RF
Mercury	7439-97-6	Liquid		>480	>480	>480	>480	>480	>480	>480	>480

> indicates greater than.

Special Warning from DuPont: Tychem® and Tyvek® fabrics should not be used around heat, flames, sparks or in potentially flammable or explosive environments. Only...

(DuPont, 2024)

First Aid

Excerpt from NIOSH Pocket Guide for Mercury compounds [except (organo) alkyls] (as Hg):

Eye: IRRIGATE IMMEDIATELY - If this chemical contacts the eyes, immediately wash (irrigate) the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately.

Skin: SOAP WASH PROMPTLY - If this chemical contacts the skin, promptly wash the contaminated skin with soap and water. If this chemical penetrates the clothing, promptly remove the clothing and wash the skin with soap and water. Get medical attention promptly.

Breathing: RESPIRATORY SUPPORT - If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

Swallow: MEDICAL ATTENTION IMMEDIATELY - If this chemical has been swallowed, get medical attention immediately. (NIOSH, 2024)

Physical Properties

Chemical Formula: Hg

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: Not flammable (USCG, 1999)

Melting Point: -38°F (USCG, 1999)

Vapor Pressure: 0.0012 mmHg (NIOSH, 2024)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 13.55 at 68°F (USCG, 1999) - Denser than water; will sink

Boiling Point: 675°F at 760 mmHg (USCG, 1999)

Molecular Weight: 200.59 (USCG, 1999)

Water Solubility: Insoluble (NIOSH, 2024)

Ionization Energy/Potential: data unavailable

IDLH: 10 mg Hg/m3 (NIOSH, 2024)

AEGLs (Acute Exposure Guideline Levels)

Interim AEGLs for Mercury Vapor (7439-97-6)

Exposure Period	AEGL-1	AEGL-2	AEGL-3
10 minutes	NR	3.1 mg/m3	16 mg/m3
30 minutes	NR	2.1 mg/m3	11 mg/m3
60 minutes	NR	1.7 mg/m3	8.9 mg/m3
4 hours	NR	0.67 mg/m3	2.2 mg/m3
8 hours	NR	0.33 mg/m3	2.2 mg/m3

NR = Not recommended due to insufficient data
(NAC/NRC, 2024)

ERPGs (Emergency Response Planning Guidelines)

Chemical	ERPG-1	ERPG-2	ERPG-3
Mercury Vapor (7439-97-6)	NA	0.25 ppm	0.5 ppm

NA = not appropriate.
(AIHA, 2022)

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Mercury vapor (7439-97-6)	0.15 mg/m3	1.7 mg/m3	8.9 mg/m3

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Mercury	7439-97-6			1 pound	313	U151	
Mercury Compounds	N458			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- MERCURY
- MERCURY ELEMENT
- MERCURY METAL
- MERCURY METAL: COLLOIDAL MERCURY
- MERCURY, METALLIC
- MERCURY, [METALLIC]
- METALLIC MERCURY
- QUECKSILBER
- QUICKSILVER

**CAMEO** *Chemicals***Chemical Datasheet****NAPHTHALENE, METHYLNAPHTHALENES****Chemical Identifiers**

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
91-20-3	1760	Corrosive	none

NIOSH Pocket Guide
Naphthalene

International Chem Safety Card
NAPHTHALENE

NFPA 704

Diamond	Hazard	Value	Description
2 2 0	Health	2	Can cause temporary incapacitation or residual injury.
	Flammability	2	Must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.
	Instability	0	Normally stable, even under fire conditions.
	Special		

(NFPA, 2010)

General Description

A black liquid with the odor of coal tar. Negligibly soluble in water. Slightly denser than water. Vapors, fumes or direct contact may irritate the eyes. Direct skin contact may produce severe burns. Inhalation may produce mucous irritation, dizziness, loss of coordination, cardiovascular collapse and death.

Hazards**Reactivity Alerts**

none

Air & Water Reactions

Negligibly soluble in water.

Fire Hazard

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. Some are oxidizers and may ignite combustibles (wood, paper, oil, clothing, etc.). Corrosives in contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. For electric vehicles or equipment, ERG Guide 147 (lithium ion or sodium ion batteries) or ERG Guide 138 (sodium batteries) should also be consulted. (ERG, 2024)

Health Hazard

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

TOXIC and/or CORROSIVE; inhalation, ingestion or skin contact with material may cause severe injury or death. Contact with molten substance may cause severe burns to skin and eyes. Avoid any skin contact. Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may be corrosive and/or toxic and cause environmental contamination. (ERG, 2024)

Reactivity Profile

A mixture containing NAPHTHALENE and METHYLNAPHTHALENES may react vigorously with strong oxidizing agents. Can react exothermically with bases and with diazo compounds. Naphthalene reacts violently with chromic anhydride [Haz. Chem. Data 1967, p 68]. Friedel-Crafts acylation of naphthalene using benzoyl chloride, catalyzed by $AlCl_3$, must be conducted above the melting point of the mixture, or the reaction may be violent [Clar, E. et al., Tetrahedron, 1974, 30, 3296].

Belongs to the Following Reactive Group(s)

- Bases, Strong
- Hydrocarbons, Aromatic

Potentially Incompatible Absorbents

Use caution: Liquids with this reactive group classification have been known to react with the absorbents listed below.

- Cellulose-Based Absorbents
- Mineral-Based & Clay-Based Absorbents

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

SMALL FIRE: Dry chemical, CO_2 or water spray.

LARGE FIRE: Dry chemical, CO₂, alcohol-resistant foam or water spray. If it can be done safely, move undamaged containers away from the area around the fire. Dike runoff from fire control for later disposal.

FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. DO NOT GET WATER INSIDE CONTAINERS. (ERG, 2024)

Protective Clothing

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

Wear positive pressure self-contained breathing apparatus (SCBA). Wear chemical protective clothing that is specifically recommended by the manufacturer when there is NO RISK OF FIRE. Structural firefighters' protective clothing provides thermal protection but only limited chemical protection. (ERG, 2024)

DuPont Tychem® Suit Fabrics

Normalized Breakthrough Times (in Minutes)

Chemical	CAS Number	State	QS	QC	SL	C3	TF	TP	RC	TK	RF
Naphthalene	91-20-3	Solid				>480	>480	>480			
Naphthalene (25% in Diethylene glycol dimethylether)	91-20-3	Liquid			79	>480	>480	>480	>480	>480	>480

> indicates greater than.

Special Warning from DuPont: Tychem® and Tyvek® fabrics should not be used around heat, flames, sparks or in potentially flammable or explosive environments. Only...

(DuPont, 2024)

First Aid

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

Refer to the "General First Aid" section. Specific First Aid: For corrosives, in case of contact, immediately flush skin or eyes with running water for at least 30 minutes. Additional flushing may be required. (ERG, 2024)

Physical Properties

Chemical Formula: C₁₀H₈

Flash Point: 174°F (NFPA, 2010)

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: data unavailable

Vapor Pressure: data unavailable

Vapor Density (Relative to Air): data unavailable

Specific Gravity: data unavailable

Boiling Point: data unavailable

Molecular Weight: data unavailable

Water Solubility: data unavailable

Ionization Energy/Potential: 8.12 eV [From NPG: Naphthalene] (NIOSH, 2024)

IDLH: 250 ppm [From NPG: Naphthalene] (NIOSH, 2024)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3	
Naphthalene (91-20-3)	15 ppm	83 ppm	500 ppm	LEL = 9000 ppm

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Naphthalene	91-20-3			100 pounds	313	U165	

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- NAPHTHALENE, METHYLNAPHTHALENES

**CAMEO** *Chemicals*[Print](#)**Chemical Datasheet**

OIL, [MOTOR]

Chemical Identifiers**CAS Number**

none

UN/NA Number

none

DOT Hazard Label

data unavailable

USCG CHRIS Code

OMT

NIOSH Pocket Guide

none

International Chem Safety Card

none

NFPA 704

data unavailable

General Description

Oily yellow-brown liquid. Less dense than water and insoluble in water. Hence floats on water. (USCG, 1999)

Hazards**Reactivity Alerts**

none

Air & Water Reactions

Flammable. Insoluble in water.

Fire Hazard

No information available.

Health Hazard

INGESTION: minimal gastrointestinal irritation; increased frequency of bowel passage may occur. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure. (USCG, 1999)

Reactivity Profile

OIL, [MOTOR] may be incompatible with strong oxidizing agents like nitric acid. Charring may occur followed by ignition of unreacted material and other nearby combustibles. In other settings, mostly unreactive. Not affected by aqueous solutions of acids, alkalis, most oxidizing agents, and most reducing agents. Burns exothermically when heated sufficiently or when ignited in the presence of air, oxygen or strong oxidizing agents.

Belongs to the Following Reactive Group(s)

- Hydrocarbons, Aliphatic Saturated

Potentially Incompatible Absorbents

No information available.

Response Recommendations**Isolation and Evacuation**

No information available.

Firefighting

Fire Extinguishing Agents Not to Be Used: Water may be ineffective

Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide (USCG, 1999)

Non-Fire Response

No information available.

Protective Clothing

Protective gloves; goggles or face shield. (USCG, 1999)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

INGESTION: do NOT lavage or induce vomiting.

ASPIRATION: treatment probably not required; delayed development of pulmonary irritation can be detected by serial chest x-rays.

EYES: wash with copious amounts of water.

SKIN: wipe off oil and wash with soap and water. (USCG, 1999)

Physical Properties

Chemical Formula: data unavailable

Flash Point: 275 to 600°F (USCG, 1999)

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: -29.9°F (USCG, 1999)

Vapor Pressure: data unavailable

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 0.84 to 0.96 at 59°F (USCG, 1999)

Boiling Point: Very high (USCG, 1999)

Molecular Weight: data unavailable

Water Solubility: data unavailable

Ionization Energy/Potential: data unavailable

IDLH: data unavailable

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

No PAC information available.

Regulatory Information

EPA Consolidated List of Lists

No regulatory information available.

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

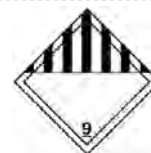
No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- CRANKCASE OIL
- LUBRICATING OIL
- OIL, [MOTOR]
- OILS, MISCELLANEOUS: MOTOR
- TRANSMISSION OIL

**CAMEO Chemicals****Chemical Datasheet****POLYCHLORINATED BIPHENYLS (PCB)****Chemical Identifiers**

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
11096-82-5	2315 (liquid)	Class 9	PCB
11097-69-1	3432 (solid)		
11104-28-2			
11141-16-5			
12672-29-6			
12674-11-2			
1336-36-3			
53469-21-9			

NIOSH Pocket Guide

Chlorodiphenyl (54% chlorine)

International Chem Safety Card

POLYCHLORINATED BIPHENYL (AROCOR 1254)

NFPA 704

Diamond	Hazard	Value	Description
1 2 0	 Health	2	Can cause temporary incapacitation or residual injury.
	 Flammability	1	Must be preheated before ignition can occur.
	 Instability	0	Normally stable, even under fire conditions.
	 Special		

Note: NFPA ratings shown are for polychlorinated biphenyls, CAS number 1336-36-3.
(NFPA, 2010)

General Description

PCBs are colorless oily liquids. Much denser than water and insoluble in water. May burn under exposure to intense heat or flames for prolonged periods of time. Primary hazard is persistence in the environment and potential for long term chronic environmental and health risks. Immediate steps should be taken to limit spread to the environment. As liquids, easily penetrate the soil to contaminate groundwater and nearby waterways.

Hazards**Reactivity Alerts**

none

Air & Water Reactions

Insoluble in water.

Fire Hazard

Special Hazards of Combustion Products: Irritating gases are generated in fires. (USCG, 1999)

Health Hazard

Acne from skin contact. (USCG, 1999)

Reactivity Profile

POLYCHLORINATED BIPHENYLS (PCB) are incompatible with the following: Strong oxidizers (NIOSH, 2024).

Belongs to the Following Reactive Group(s)

- Aryl Halides

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 171 [Substances (Low to Moderate Hazard)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 171 [Substances (Low to Moderate Hazard)]:

CAUTION: Fire involving Safety devices (UN3268) and Fire suppressant dispersing devices (UN3559) may have a delayed activation and a risk of hazardous projectiles. Extinguish the fire at a safe distance.

SMALL FIRE: Dry chemical, CO₂, water spray or regular foam.

LARGE FIRE: Water spray, fog or regular foam. Do not scatter spilled material with high-pressure water streams. If it can be done safely, move undamaged containers away from the area around the fire. Dike runoff from fire control for later disposal.

FIRE INVOLVING TANKS: Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 171 [Substances (Low to Moderate Hazard)]:

Do not touch or walk through spilled material. Stop leak if you can do it without risk. Prevent dust cloud. For Asbestos, avoid inhalation of dust. Cover spill with plastic sheet or tarp to minimize spreading. Do not clean up or dispose of, except under supervision of a specialist.

SMALL DRY SPILL: With clean shovel, place material into clean, dry container and cover loosely; move containers from spill area.

SMALL SPILL: Pick up with sand or other non-combustible absorbent material and place into containers for later disposal.

LARGE SPILL: Dike far ahead of liquid spill for later disposal. Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent entry into waterways, sewers, basements or confined areas. (ERG, 2024)

Protective Clothing

Excerpt from NIOSH Pocket Guide for Chlorodiphenyl (54% chlorine):

Skin: PREVENT SKIN CONTACT - Wear appropriate personal protective clothing to prevent skin contact.

Eyes: PREVENT EYE CONTACT - Wear appropriate eye protection to prevent eye contact.

Wash skin: WHEN CONTAMINATED - The worker should immediately wash the skin when it becomes contaminated.

Remove: WHEN WET OR CONTAMINATED - Work clothing that becomes wet or significantly contaminated should be removed and replaced.

Change: DAILY - Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premises.

Provide:

- **EYEWASH** - Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substances; this is irrespective of the recommendation involving the wearing of eye protection.
- **QUICK DRENCH** - Facilities for quickly drenching the body should be provided within the immediate work area for emergency use where there is a possibility of exposure. [Note: It is intended that these facilities provide a sufficient quantity or flow of water to quickly remove the substance from any body areas likely to be exposed. The actual determination of what constitutes an adequate quick drench facility depends on the specific circumstances. In certain instances, a deluge shower should be readily available, whereas in others, the availability of water from a sink or hose could be considered adequate.] (NIOSH, 2024)

DuPont Tychem® Suit Fabrics

Normalized Breakthrough Times (in Minutes)

Chemical	CAS Number	State	QS	QC	SL	C3	TF	TP	RC	TK	RF
PCB 1254 (50% in Mineral Oil)	11097-69-1	Liquid			>480				>480		
PCB 1254 (90%)	11097-69-1	Liquid			>480						

> indicates greater than.

Special Warning from DuPont: Tychem® and Tyvek® fabrics should not be used around heat, flames, sparks or in potentially flammable or explosive environments. Only...

(DuPont, 2024)

First Aid

Excerpt from NIOSH Pocket Guide for Chlorodiphenyl (54% chlorine):

Eye: IRRIGATE IMMEDIATELY - If this chemical contacts the eyes, immediately wash (irrigate) the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately.

Skin: SOAP WASH IMMEDIATELY - If this chemical contacts the skin, immediately wash the contaminated skin with soap and water. If this chemical penetrates the clothing, immediately remove the clothing, wash the skin with soap and water, and get medical attention promptly.

Breathing: RESPIRATORY SUPPORT - If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

Swallow: MEDICAL ATTENTION IMMEDIATELY - If this chemical has been swallowed, get medical attention immediately. (NIOSH, 2024)

Physical Properties

Chemical Formula: data unavailable

Flash Point: greater than 286°F (USCG, 1999)

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: data unavailable

Vapor Pressure: data unavailable

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 1.3 to 1.8 at 68°F (USCG, 1999)

Boiling Point: Very high (USCG, 1999)

Molecular Weight: data unavailable

Water Solubility: data unavailable

Ionization Energy/Potential: data unavailable

IDLH: 5 mg/m³ ; A potential occupational carcinogen. [From NPG: Chlorodiphenyl (54% chlorine)] (NIOSH, 2024)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Polychlorinated biphenyl (Aroclor 1260); (Chlorodiphenyl (60% Cl)) (11096-82-5)	0.41 mg/m ³	4.5 mg/m ³	260 mg/m ³

Chemical	PAC-1	PAC-2	PAC-3
Polychlorinated biphenyl (Aroclor 1254); (Chlorodiphenyl (54% Cl)) (11097-69-1)	1.5 mg/m3	68 mg/m3	200 mg/m3
Polychlorinated biphenyl (Aroclor 1221); (Chlorodiphenyl (21% Cl)) (11104-28-2)	12 mg/m3	130 mg/m3	790 mg/m3
Polychlorinated biphenyl (Aroclor 1232); (Chlorodiphenyl (32% Cl)) (11141-16-5)	13 mg/m3	150 mg/m3	890 mg/m3
Polychlorinated biphenyl (Aroclor 1248); (Chlorodiphenyl (48% Cl)) (12672-29-6)	6.6 mg/m3	72 mg/m3	2200 mg/m3
Polychlorinated biphenyl (Aroclor 1016); (Chlorodiphenyl (41% Cl)) (12674-11-2)	5.6 mg/m3	62 mg/m3	460 mg/m3
Polychlorinated biphenyl; (Aroclor; PCBs) (1336-36-3)	13 mg/m3	140 mg/m3	840 mg/m3
Polychlorinated biphenyl (Aroclor 1242); (Chlorodiphenyl (42% Cl)) (53469-21-9)	3 mg/m3	140 mg/m3	840 mg/m3

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Aroclor 1016	12674-11-2			1 pound			
Aroclor 1221	11104-28-2			1 pound			
Aroclor 1232	11141-16-5			1 pound			
Aroclor 1242	53469-21-9			1 pound			
Aroclor 1248	12672-29-6			1 pound			
Aroclor 1254	11097-69-1			1 pound			
Aroclor 1260	11096-82-5			1 pound			
PCBs	1336-36-3			1 pound	X		
Polychlorinated biphenyls	1336-36-3			1 pound	313		

"X" indicates that this is a second name for an EPCRA section 313 chemical already included on this consolidated list. May also indicate that the same chemical with the same CAS number appears on another list with a different chemical name.

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- A 1248
- AROCHLOR
- AROCLOR 1016
- AROCLOR 1221
- AROCLOR 1232
- AROCLOR 1242
- AROCLOR 1248
- AROCLOR 1254
- AROCLOR 1260
- AROCLOR® 1254
- CHLORINATED BIPHENYL
- CHLORODIPHENYL (54% CHLORINE)
- HALOGENATED WAXES
- PCB
- PCBS
- POLYCHLORINATED BIPHENYL
- POLYCHLORINATED BIPHENYLS
- POLYCHLORINATED BIPHENYLS (PCB)
- POLYCHLOROPOLYPHENYLS

**CAMEO** *Chemicals***Chemical Datasheet****PERCHLOROETHYLENE****Chemical Identifiers****CAS Number**127-18-4 **UN/NA Number**

1897

DOT Hazard Label

Poison

USCG CHRIS Code

TTE

NIOSH Pocket Guide

Tetrachloroethylene

International Chem Safety Card

TETRACHLOROETHYLENE

NFPA 704

Diamond	Hazard	Value	Description
0 2 0	 Health	2	Can cause temporary incapacitation or residual injury.
	 Flammability	0	Will not burn under typical fire conditions.
	 Instability	0	Normally stable, even under fire conditions.
	 Special		

(NFPA, 2010)

General Description

A clear colorless volatile liquid having an ether-like odor. Noncombustible. Insoluble in water. Vapors heavier than air. Density approximately 13.5 lb / gal. Used as dry cleaning solvent, a degreasing solvent, a drying agent for metals, and in the manufacture of other chemicals.

Hazards**Reactivity Alerts**

none

Air & Water Reactions

Insoluble in water.

Fire Hazard

Special Hazards of Combustion Products: Toxic, irritating gases may be generated in fires. (USCG, 1999)

Health Hazard

Vapor can affect central nervous system and cause anesthesia. Liquid may irritate skin after prolonged contact. May irritate eyes but causes no injury. (USCG, 1999)

Reactivity Profile

PERCHLOROETHYLENE decomposes upon heating and exposure to UV light to give phosgene and HCl. Reacts violently with finely dispersed light metals (aluminum) and zinc. [Handling Chemicals Safely 1980 p. 887]. Mixtures with finely divided barium or lithium metal can detonate [ASESB Pot. Incid. 39. 1968; Chem. Eng. News 46(9):38. 1968]. Decomposes very slowly in water to form trichloroacetic acid and hydrochloric acid

Belongs to the Following Reactive Group(s)

- Halogenated Organic Compounds
- Hydrocarbons, Aliphatic Unsaturated

Potentially Incompatible Absorbents

Use caution: Liquids with this reactive group classification have been known to react with the absorbent listed below.

- Dirt/Earth

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 160 [Halogenated Solvents]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area for at least 50 meters (150 feet) in all directions.

LARGE SPILL: Consider initial downwind evacuation for at least 100 meters (330 feet).

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 160 [Halogenated Solvents]:

SMALL FIRE: Dry chemical, CO2 or water spray.

LARGE FIRE: Dry chemical, CO2, alcohol-resistant foam or water spray. If it can be done safely, move undamaged containers away from the area around the fire. Dike runoff from fire control for later disposal.

FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 160 [Halogenated Solvents]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area. Stop leak if you can do it

without risk.

SMALL LIQUID SPILL: Pick up with sand, earth or other non-combustible absorbent material.

LARGE SPILL: Dike far ahead of liquid spill for later disposal. Prevent entry into waterways, sewers, basements or confined areas. (ERG, 2024)

Protective Clothing

Excerpt from NIOSH Pocket Guide for Tetrachloroethylene:

Skin: PREVENT SKIN CONTACT - Wear appropriate personal protective clothing to prevent skin contact.

Eyes: PREVENT EYE CONTACT - Wear appropriate eye protection to prevent eye contact.

Wash skin: WHEN CONTAMINATED - The worker should immediately wash the skin when it becomes contaminated.

Remove: WHEN WET OR CONTAMINATED - Work clothing that becomes wet or significantly contaminated should be removed and replaced.

Change: No recommendation is made specifying the need for the worker to change clothing after the workshift.

Provide:

- **EYEWASH** - Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substances; this is irrespective of the recommendation involving the wearing of eye protection.
- **QUICK DRENCH** - Facilities for quickly drenching the body should be provided within the immediate work area for emergency use where there is a possibility of exposure. [Note: It is intended that these facilities provide a sufficient quantity or flow of water to quickly remove the substance from any body areas likely to be exposed. The actual determination of what constitutes an adequate quick drench facility depends on the specific circumstances. In certain instances, a deluge shower should be readily available, whereas in others, the availability of water from a sink or hose could be considered adequate.] (NIOSH, 2024)

DuPont Tychem® Suit Fabrics

Normalized Breakthrough Times (in Minutes)

Chemical	CAS Number	State	QS	QC	SL	C3	TF	TP	RC	TK	RF
Ethylene tetrachloride	127-18-4	Liquid		imm	imm	>480	>480	>480	>480	>480	>480
Tetrachloro ethylene, 1,1,2,2-	127-18-4	Liquid		imm	imm	>480	>480	>480	>480	>480	>480

> indicates greater than.

"imm" indicates immediate; having a normalized breakthrough time of 10 minutes or less.

Special Warning from DuPont: Tychem® and Tyvek® fabrics should not be used around heat, flames, sparks or in potentially flammable or explosive environments. Only...

(DuPont, 2024)

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. **IMMEDIATELY** transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: **IMMEDIATELY** flood affected skin with water while removing and isolating all contaminated clothing. Gently

wash all affected skin areas thoroughly with soap and water. IMMEDIATELY call a hospital or poison control center even if no symptoms (such as redness or irritation) develop. IMMEDIATELY transport the victim to a hospital for treatment after washing the affected areas.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: DO NOT INDUCE VOMITING. Corrosive chemicals will destroy the membranes of the mouth, throat, and esophagus and, in addition, have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. Transport the victim IMMEDIATELY to a hospital.

OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

Physical Properties

Chemical Formula: C₂Cl₄

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: Not flammable (USCG, 1999)

Melting Point: -2°F (NTP, 1992)

Vapor Pressure: 14 mmHg at 68°F ; 15.8 mmHg at 72°F (NTP, 1992)

Vapor Density (Relative to Air): 5.83 (NTP, 1992) - Heavier than air; will sink

Specific Gravity: 1.63 at 68°F (USCG, 1999) - Denser than water; will sink

Boiling Point: 250°F at 760 mmHg (NTP, 1992)

Molecular Weight: 165.83 (NTP, 1992)

Water Solubility: less than 0.1 mg/mL at 63°F (NTP, 1992)

Ionization Energy/Potential: 9.32 eV (NIOSH, 2024)

IDLH: 150 ppm ; A potential occupational carcinogen. (NIOSH, 2024)

AEGLs (Acute Exposure Guideline Levels)

Interim AEGLs for Tetrachloroethylene (127-18-4)

Exposure Period	AEGL-1	AEGL-2	AEGL-3
10 minutes	35 ppm	230 ppm	1600 ppm
30 minutes	35 ppm	230 ppm	1600 ppm

Exposure Period	AEGL-1	AEGL-2	AEGL-3
60 minutes	35 ppm	230 ppm	1200 ppm
4 hours	35 ppm	120 ppm	580 ppm
8 hours	35 ppm	81 ppm	410 ppm

(NAC/NRC, 2024)

ERPGs (Emergency Response Planning Guidelines)

Chemical	ERPG-1	ERPG-2	ERPG-3
Perchloroethylene (127-18-4)	100 ppm 	200 ppm	1000 ppm

 indicates that odor should be detectable near ERPG-1.

(AIHA, 2022)

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Perchloroethylene; (Tetrachloroethylene) (127-18-4)	35 ppm	230 ppm	1200 ppm

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Perchloroethylene	127-18-4			100 pounds	X	U210	
Tetrachloroethylene	127-18-4			100 pounds	313	U210	

"X" indicates that this is a second name for an EPCRA section 313 chemical already included on this consolidated list. May also indicate that the same chemical with the same CAS number appears on another list with a different chemical name.

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- ANKILOSTIN
- ANTISAL 1
- ANTISOL 1
- CARBON BICHLORIDE
- CARBON DICHLORIDE
- DIDAKENE

- DILATIN PT
- DOW-PER
- ENT 1,860
- ETHENE, TETRACHLORO-
- ETHYLENE TETRACHLORIDE
- ETHYLENE, TETRACHLORO-
- F 1110
- F 1110 (HALOCARBON)
- FEDAL-UN
- FREON 1110
- NCI-C04580
- NEMA
- PCE
- PER
- PERAWIN
- PERC
- PERCHLOR
- PERCHLORETHYLENE
- PERCHLOROETHENE
- PERCHLOROETHYLENE
- PERCLEN
- PERCLEN D
- PERCOSOLVE
- PERK
- PERKLONE
- PERSEC
- R 1110
- TETLEN
- TETRACAP
- TETRACHLORETHYLENE
- TETRACHLOROETHENE
- 1,1,2,2-TETRACHLOROETHENE
- TETRACHLOROETHYLENE
- 1,1,2,2-TETRACHLOROETHYLENE
- TETRAGUER
- TETRALENO
- TETRALEX
- TETRAVEC
- TETROGUER
- TETROPIL

**CAMEO** *Chemicals***Chemical Datasheet****BIS(TRIBUTYLTIN) OXIDE****Chemical Identifiers**

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
56-35-9	2788	Poison	none

NIOSH Pocket Guide
none

International Chem Safety Card
TRIBUTYLTIN OXIDE

NFPA 704

data unavailable

General Description

PHYSICAL DESCRIPTION: Clear pale yellow liquid. Toxic by skin absorption or inhalation of vapors. Used as a bactericide, fungicide and chemical intermediate.

Hazards**Reactivity Alerts**

none

Air & Water Reactions

Insoluble in water.

Fire Hazard

This chemical is probably combustible. (NTP, 1992)

Health Hazard

ACUTE/CHRONIC HAZARDS: This material is toxic by ingestion and inhalation and is a skin and eye irritant. (NTP, 1992)

Reactivity Profile

BIS(TRIBUTYLTIN) OXIDE may react vigorously with oxidizing agents and with reducing agents.

Belongs to the Following Reactive Group(s)

- Organometallics

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 153 [Substances - Toxic and/or Corrosive (Combustible)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Fires involving this material can be controlled with a dry chemical, carbon dioxide or Halon extinguisher. (NTP, 1992)

Non-Fire Response

SMALL SPILLS AND LEAKAGE: If you should spill this chemical, use absorbent paper to pick up all liquid spill material. Your contaminated clothing and absorbent paper should be sealed in a vapor-tight plastic bag for eventual disposal. Solvent wash all contaminated surfaces with acetone followed by washing with a strong soap and water solution. Do not reenter the contaminated area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.

STORAGE PRECAUTIONS: You should store this material in a refrigerator. (NTP, 1992)

Protective Clothing

MINIMUM PROTECTIVE CLOTHING: If Tyvek-type disposable protective clothing is not worn during handling of this chemical, wear disposable Tyvek-type sleeves taped to your gloves.

RECOMMENDED RESPIRATOR: Where the neat test chemical is weighed and diluted, wear a NIOSH-approved half face respirator equipped with an organic vapor/acid gas cartridge (specific for organic vapors, HCl, acid gas and SO₂) with a dust/mist filter. (NTP, 1992)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. IMMEDIATELY call a hospital or poison control center

even if no symptoms (such as redness or irritation) develop. IMMEDIATELY transport the victim to a hospital for treatment after washing the affected areas.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: Some heavy metals are VERY TOXIC POISONS, especially if their salts are very soluble in water (e.g., lead, chromium, mercury, bismuth, osmium, and arsenic). IMMEDIATELY call a hospital or poison control center and locate activated charcoal, egg whites, or milk in case the medical advisor recommends administering one of them. Also locate Ipecac syrup or a glass of salt water in case the medical advisor recommends inducing vomiting. Usually, this is NOT RECOMMENDED outside of a physician's care. If advice from a physician is not readily available and the victim is conscious and not convulsing, give the victim a glass of activated charcoal slurry in water or, if this is not available, a glass of milk, or beaten egg whites and IMMEDIATELY transport victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, assure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

Physical Properties

Chemical Formula: C₂₄H₅₄OSn₂

Flash Point: greater than 200°F (NTP, 1992)

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: data unavailable

Vapor Pressure: data unavailable

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 1.17 at 77°F (NTP, 1992) - Denser than water; will sink

Boiling Point: 356°F at 2 mmHg (NTP, 1992)

Molecular Weight: 596.08 (NTP, 1992)

Water Solubility: less than 1 mg/mL at 70.7°F (NTP, 1992)

Ionization Energy/Potential: data unavailable

IDLH: data unavailable

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

No PAC information available.

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Bis(tributyltin) oxide	56-35-9				313		

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- ACETO TBTO
- BIOMET 66
- BIOMET SRM
- BIOMET TBTO
- BIS(TRIBUTYLOXIDE) OF TIN
- BIS(TRIBUTYLSTANNIC OXIDE)
- BIS(TRIBUTYLSTANNYL) ETHER
- BIS(TRIBUTYLSTANNYL) OXIDE
- BIS(TRIBUTYLTIN) OXIDE
- BTO
- BUTINOX
- C-SN-9
- DI-TRIBUTYL TIN OXIDE
- DIALL
- ENT 24,979
- HEXABUTYLDISTANNOXANE
- HEXABUTYLDITIN
- HEXABUTYLDITIN OXIDE
- INTERCIDE 340A
- L.S. 3394
- LASTANOX F
- LASTANOX Q
- LASTANOX Q1
- LASTANOX SUPER
- LASTANOX T
- LASTANOX T 20
- MT 1E
- MYKOLASTANOX F
- 6-OXA-5,7-DISTANNAUNDECANE, 5,5,7,7-TETRABUTYL-
- OXYBIS(TRIBUTYLSTANNANE)
- OXYBIS(TRIBUTYLTIN)
- OXYBIS[TRIBUTYLTIN]
- STANNICIDE A
- STANNICIDE O
- TBOT

- TBTO
- TRI-N-BUTYLSTANNANE OXIDE
- TRIBUTYLTIN OXIDE
- VIKOL AF 25
- VIKOL LO 25

**CAMEO** *Chemicals***Chemical Datasheet****TRICHLOROETHYLENE****Chemical Identifiers****CAS Number**

79-01-6

UN/NA Number

1710

DOT Hazard Label

Poison

USCG CHRIS Code

TCL

NIOSH Pocket Guide

Trichloroethylene

International Chem Safety Card

TRICHLOROETHYLENE

NFPA 704

Diamond	Hazard	Value	Description
1 2 0	Health	2	Can cause temporary incapacitation or residual injury.
	Flammability	1	Must be preheated before ignition can occur.
	Instability	0	Normally stable, even under fire conditions.
	Special		

(NFPA, 2010)

General Description

A clear colorless volatile liquid having a chloroform-like odor. Denser than water and is slightly soluble in water. Noncombustible. Used as a solvent, fumigant, in the manufacture of other chemicals, and for many other uses.

Hazards**Reactivity Alerts**

none

Air & Water Reactions

Slightly soluble in water.

Fire Hazard

Special Hazards of Combustion Products: Toxic and irritating gases are produced in fire situations. (USCG, 1999)

Health Hazard

INHALATION: symptoms range from irritation of the nose and throat to nausea, an attitude of irresponsibility, blurred vision, and finally disturbance of central nervous system resulting in cardiac failure. Chronic exposure may cause organic injury. INGESTION: symptoms similar to inhalation. SKIN: defatting action can cause dermatitis. EYES: slightly irritating sensation and lachrymation. (USCG, 1999)

Reactivity Profile

It has been determined experimentally that mixtures of finely divided barium metal and a number of halogenated hydrocarbons possess an explosive capability. Specifically, impact sensitivity tests have shown that granular barium in contact with monofluorotrichloromethane, trichlorotrifluoroethane, carbon tetrachloride, trichloroethylene, or tetrachloroethylene can detonate (ASESB Pot. Incid. 39. 1968; Chem. Eng. News 46(9):38. 1968). It has been determined experimentally that a mixture of beryllium powder with carbon tetrachloride or with trichloroethylene will flash or spark on heavy impact (ASESB Pot. Incid. 39. 1968). A mixture of powdered magnesium with trichloroethylene or with carbon tetrachloride will flash or spark under heavy impact (ASESB Pot. Incid. 39. 1968).

Belongs to the Following Reactive Group(s)

- Halogenated Organic Compounds
- Hydrocarbons, Aliphatic Unsaturated

Potentially Incompatible Absorbents

Use caution: Liquids with this reactive group classification have been known to react with the absorbent listed below.

- Dirt/Earth

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 160 [Halogenated Solvents]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area for at least 50 meters (150 feet) in all directions.

LARGE SPILL: Consider initial downwind evacuation for at least 100 meters (330 feet).

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 160 [Halogenated Solvents]:

SMALL FIRE: Dry chemical, CO2 or water spray.

LARGE FIRE: Dry chemical, CO2, alcohol-resistant foam or water spray. If it can be done safely, move undamaged containers away from the area around the fire. Dike runoff from fire control for later disposal.

FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 160 [Halogenated Solvents]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area. Stop leak if you can do it without risk.

SMALL LIQUID SPILL: Pick up with sand, earth or other non-combustible absorbent material.

LARGE SPILL: Dike far ahead of liquid spill for later disposal. Prevent entry into waterways, sewers, basements or confined areas. (ERG, 2024)

Protective Clothing

Excerpt from NIOSH Pocket Guide for Trichloroethylene:

Skin: PREVENT SKIN CONTACT - Wear appropriate personal protective clothing to prevent skin contact.

Eyes: PREVENT EYE CONTACT - Wear appropriate eye protection to prevent eye contact.

Wash skin: WHEN CONTAMINATED - The worker should immediately wash the skin when it becomes contaminated.

Remove: WHEN WET OR CONTAMINATED - Work clothing that becomes wet or significantly contaminated should be removed and replaced.

Change: No recommendation is made specifying the need for the worker to change clothing after the workshift.

Provide:

- EYEWASH - Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substances; this is irrespective of the recommendation involving the wearing of eye protection.
- QUICK DRENCH - Facilities for quickly drenching the body should be provided within the immediate work area for emergency use where there is a possibility of exposure. [Note: It is intended that these facilities provide a sufficient quantity or flow of water to quickly remove the substance from any body areas likely to be exposed. The actual determination of what constitutes an adequate quick drench facility depends on the specific circumstances. In certain instances, a deluge shower should be readily available, whereas in others, the availability of water from a sink or hose could be considered adequate.] (NIOSH, 2024)

DuPont Tychem® Suit Fabrics

Normalized Breakthrough Times (in Minutes)

Chemical	CAS Number	State	QS	QC	SL	C3	TF	TP	RC	TK	RF
Ethylene trichloride	79-01-6	Liquid			imm	>480	>480	>480	>480	>480	>480
Trichloro ethylene	79-01-6	Liquid			imm	>480	>480	>480	>480	>480	>480

> indicates greater than.

"imm" indicates immediate; having a normalized breakthrough time of 10 minutes or less.

Special Warning from DuPont: Tychem® and Tyvek® fabrics should not be used around heat, flames, sparks or in potentially flammable or explosive environments. Only...

(DuPont, 2024)

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any

ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. IMMEDIATELY call a hospital or poison control center even if no symptoms (such as redness or irritation) develop. IMMEDIATELY transport the victim to a hospital for treatment after washing the affected areas.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital.

OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

Physical Properties

Chemical Formula: C₂HCl₃

Flash Point: greater than 200°F (NTP, 1992)

Lower Explosive Limit (LEL): 12.5 % (NTP, 1992)

Upper Explosive Limit (UEL): 90 % (NTP, 1992)

Autoignition Temperature: 770°F (USCG, 1999)

Melting Point: -99°F (NTP, 1992)

Vapor Pressure: 60 mmHg at 68°F ; 77 mmHg at 77°F (NTP, 1992)

Vapor Density (Relative to Air): 4.53 (NTP, 1992) - Heavier than air; will sink

Specific Gravity: 1.46 at 68°F (USCG, 1999) - Denser than water; will sink

Boiling Point: 189°F at 760 mmHg (NTP, 1992)

Molecular Weight: 131.4 (NTP, 1992)

Water Solubility: less than 1 mg/mL at 70°F (NTP, 1992)

Ionization Energy/Potential: 9.45 eV (NIOSH, 2024)

IDLH: 1000 ppm ; A potential occupational carcinogen. (NIOSH, 2024)

AEGLs (Acute Exposure Guideline Levels)

Interim AEGLs for Trichloroethylene (79-01-6)

Exposure Period	AEGL-1	AEGL-2	AEGL-3
10 minutes	260 ppm	960 ppm	6100 ppm

Exposure Period	AEGL-1	AEGL-2	AEGL-3
30 minutes	180 ppm	620 ppm	6100 ppm
60 minutes	130 ppm	450 ppm	3800 ppm
4 hours	84 ppm	270 ppm	1500 ppm
8 hours	77 ppm	240 ppm	970 ppm

(NAC/NRC, 2024)

ERPGs (Emergency Response Planning Guidelines)

Chemical	ERPG-1	ERPG-2	ERPG-3
Trichloroethylene (79-01-6)	100 ppm 🌬️	500 ppm	5000 ppm

🌬️ indicates that odor should be detectable near ERPG-1.

(AIHA, 2022)

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3	
Trichloroethylene (79-01-6)	130 ppm	450 ppm	3800 ppm	LEL = 80000 ppm

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Trichloroethylene	79-01-6			100 pounds	313	U228	

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- ACETYLENE TRICHLORIDE
- ALGYLEN
- ANAMENTH
- BENZINOL
- BLACOSOLV
- BLANCOSOLV
- CECOLENE
- CHLORILEN
- 1-CHLORO-2,2-DICHLOROETHYLENE
- CHLORYLEA

- CHLORYLEN
- CHORYLEN
- CIRCOSOLV
- CRAWHASPOL
- DENSINFLUAT
- 1,1-DICHLORO-2-CHLOROETHYLENE
- DOW-TRI
- DUKERON
- ETHINYL TRICHLORIDE
- ETHYLENE TRICHLORIDE
- ETHYLENE, TRICHLORO-
- F 1120
- FLECK-FLIP
- FLOCK FLIP
- FLUATE
- GEMALGENE
- GERMALGENE
- LANADIN
- LETHURIN
- NARCOGEN
- NARKOGEN
- NARKOSOID
- NCI-C04546
- NIALK
- PERM-A-CHLOR
- PERM-A-CLOR
- PETZINOL
- PHILEX
- R 1120
- TCE
- THRETHYLEN
- THRETHYLENE
- TRETHYLENE
- TRI
- TRI-CLENE
- TRI-PLUS
- TRI-PLUS M
- TRIAD
- TRIAL
- TRIASOL
- TRICHLORAN
- TRICHLOREN
- TRICHLORETHYLENE
- TRICHLOROETHENE
- TRICHLOROETHYLENE
- 1,1,2-TRICHLOROETHYLENE
- 1,2,2-TRICHLOROETHYLENE
- TRICLENE
- TRIELENE
- TRIELIN
- TRIELINE
- TRIKLONE

- TRIKLONE N
- TRILEN
- TRILENE
- TRILINE
- TRIMAR
- TRIOL
- VESTROL
- VITRAN
- WESTROSOL

**CAMEO** *Chemicals***Chemical Datasheet****TOLUENE****Chemical Identifiers****CAS Number**108-88-3 **UN/NA Number**

1294

DOT Hazard Label

Flammable Liquid

USCG CHRIS Code

TOL

NIOSH Pocket Guide

Toluene

International Chem Safety Card

TOLUENE

NFPA 704

Diamond	Hazard	Value	Description
3 2 0	 Health	2	Can cause temporary incapacitation or residual injury.
	 Flammability	3	Can be ignited under almost all ambient temperature conditions.
	 Instability	0	Normally stable, even under fire conditions.
	 Special		

(NFPA, 2010)

General Description

A clear colorless liquid with a characteristic aromatic odor. Flash point 40°F. Less dense than water (7.2 lb / gal) and insoluble in water. Hence floats on water. Vapors heavier than air. May be toxic by inhalation, ingestion or skin contact. Used in aviation and automotive fuels, as a solvent, and to make other chemicals.

Hazards**Reactivity Alerts**

Highly Flammable

Air & Water Reactions

Highly flammable. Insoluble in water.

Fire Hazard

Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash

back. (USCG, 1999)

Health Hazard

Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration. (USCG, 1999)

Reactivity Profile

TOLUENE reacts vigorously with allyl chloride or other alkyl halides even at -70°C in the presence of ethyl aluminum dichloride or ethyl aluminum sesquichloride. Explosions have been reported [NFPA 491M 1991]. Incompatible with strong oxidizing agents. When added to a tank of sulfur dichloride, the tank over pressurized and ruptured in a reaction thought to be catalyzed by iron or iron(III) chloride [Chem. Eng. News, 1988, 66(32), 2].

Belongs to the Following Reactive Group(s)

- Hydrocarbons, Aromatic

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 130 [Flammable Liquids (Water-Immiscible / Noxious)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area for at least 50 meters (150 feet) in all directions.

LARGE SPILL: Consider initial downwind evacuation for at least 300 meters (1000 feet).

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 130 [Flammable Liquids (Water-Immiscible / Noxious)]:

CAUTION: The majority of these products have a very low flash point. Use of water spray when fighting fire may be inefficient.

SMALL FIRE: Dry chemical, CO₂, water spray or regular foam. If regular foam is ineffective or unavailable, use alcohol-resistant foam.

LARGE FIRE: Water spray, fog or regular foam. If regular foam is ineffective or unavailable, use alcohol-resistant foam. Avoid aiming straight or solid streams directly onto the product. If it can be done safely, move undamaged containers away from the area around the fire.

FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. For massive fire, use unmanned master stream devices

or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 130 [Flammable Liquids (Water-Immiscible / Noxious)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A vapor-suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean, non-sparking tools to collect absorbed material.

LARGE SPILL: Dike far ahead of liquid spill for later disposal. Water spray may reduce vapor, but may not prevent ignition in closed spaces. (ERG, 2024)

Protective Clothing

Excerpt from NIOSH Pocket Guide for Toluene:

Skin: PREVENT SKIN CONTACT - Wear appropriate personal protective clothing to prevent skin contact.

Eyes: PREVENT EYE CONTACT - Wear appropriate eye protection to prevent eye contact.

Wash skin: WHEN CONTAMINATED - The worker should immediately wash the skin when it becomes contaminated.

Remove: WHEN WET (FLAMMABLE) - Work clothing that becomes wet should be immediately removed due to its flammability hazard (i.e., for liquids with a flash point <100°F).

Change: No recommendation is made specifying the need for the worker to change clothing after the workshift. (NIOSH, 2024)

DuPont Tychem® Suit Fabrics

Normalized Breakthrough Times (in Minutes)

Chemical	CAS Number	State	QS	QC	SL	C3	TF	TP	RC	TK	RF
Methyl benzol	108-88-3	Liquid		imm	imm	>480	>480	>480	>480	>480	>480
Toluene	108-88-3	Liquid		imm	imm	>480	>480	>480	>480	>480	>480

> indicates greater than.

"imm" indicates immediate; having a normalized breakthrough time of 10 minutes or less.

Special Warning from DuPont: Tychem® and Tyvek® fabrics should not be used around heat, flames, sparks or in potentially flammable or explosive environments. Only...

(DuPont, 2024)

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop,

IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: DO NOT INDUCE VOMITING. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. Be prepared to transport the victim to a hospital if advised by a physician. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

Physical Properties

Chemical Formula: C7H8

Flash Point: 40°F (NTP, 1992)

Lower Explosive Limit (LEL): 1.27 % (NTP, 1992)

Upper Explosive Limit (UEL): 7.1 % (NTP, 1992)

Autoignition Temperature: 896°F (USCG, 1999)

Melting Point: -139°F (NTP, 1992)

Vapor Pressure: 10 mmHg at 43.5°F ; 20 mmHg at 65.1°F; 40 mmHg at 89.2°F (NTP, 1992)

Vapor Density (Relative to Air): 3.14 (NTP, 1992) - Heavier than air; will sink

Specific Gravity: 0.867 at 68°F (USCG, 1999) - Less dense than water; will float

Boiling Point: 231.1°F at 760 mmHg (NTP, 1992)

Molecular Weight: 92.14 (NTP, 1992)

Water Solubility: less than 1 mg/mL at 64°F (NTP, 1992)

Ionization Energy/Potential: 8.82 eV (NIOSH, 2024)

IDLH: 500 ppm (NIOSH, 2024)

AEGLs (Acute Exposure Guideline Levels)

Final AEGLs for Toluene (108-88-3)

Exposure Period	AEGL-1	AEGL-2	AEGL-3
10 minutes	67 ppm	1400 ppm 	10000 ppm  
30 minutes	67 ppm	760 ppm	5200 ppm 
60 minutes	67 ppm	560 ppm	3700 ppm 
4 hours	67 ppm	310 ppm	1800 ppm 
8 hours	67 ppm	250 ppm	1400 ppm 

Lower Explosive Limit (LEL) = 14000 ppm

 indicates value is 10-49% of LEL. Safety consideration against explosions must be taken into account.

  indicates value is 50-99% of LEL. Extreme safety consideration against explosions must be taken into account.

(NAC/NRC, 2024)

ERPGs (Emergency Response Planning Guidelines)

Chemical	ERPG-1	ERPG-2	ERPG-3
Toluene (108-88-3)	50 ppm 	300 ppm	1000 ppm

 indicates that odor should be detectable near ERPG-1.

(AIHA, 2022)

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3	
Toluene (108-88-3)	67 ppm	560 ppm	3700 ppm 	LEL = 14000 ppm

 indicates value is 10-49% of LEL.

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Toluene	108-88-3			1000 pounds	313	U220	

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- ANTISAL 1A
- BENZENE, METHYL-
- CP 25
- CP 25 (SOLVENT)
- METHACIDE
- METHANE, PHENYL-
- METHYL BENZENE
- METHYL BENZOL
- METHYLBENZENE
- 1-METHYLBENZENE
- METHYLBENZOL
- NCI-C07272
- PHENYL METHANE
- PHENYLMETHANE
- TOLU-SOL
- TOLUENE

- TOLUOL



CAMEO Chemicals



Chemical Datasheet

XYLENE, [MIXED ISOMERS]



Chemical Identifiers

CAS Number

1330-20-7 (mixed isomers)

95-47-6 (o-xylene)

106-42-3 (p-xylene)

108-38-3 (m-xylene)

UN/NA Number

1307

DOT Hazard Label

Flammable Liquid

USCG CHRIS Code

none

NIOSH Pocket Guide

o-Xylene

International Chem Safety Card

m-XYLENE

o-XYLENE

p-XYLENE

NFPA 704

Diamond	Hazard	Value	Description
3 2 0	Health	2	Can cause temporary incapacitation or residual injury.
	Flammability	3	Can be ignited under almost all ambient temperature conditions.
	Instability	0	Normally stable, even under fire conditions.
	Special		

(NFPA, 2010)

General Description

A clear colorless liquid with a characteristic aromatic odor consisting of a mixture of the three isomers (ortho-, meta- and para-). The latter two predominate. Flash point 81-115°F. Less dense (at 7.2 lb / gal) than water and insoluble in water. Hence floats on water. May be toxic by ingestion. Vapors heavier than air and may be narcotic in high concentrations. Used as a solvent for paints and adhesives, and to make other chemicals.

Hazards

Reactivity Alerts

Highly Flammable

Air & Water Reactions

Flammable. Insoluble in water.

Fire Hazard

Excerpt from ERG Guide 130 [Flammable Liquids (Water-Immiscible / Noxious)]:

HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Most vapors are heavier than air. They will spread along the ground and collect in low or confined areas (sewers, basements, tanks, etc.). Vapor explosion hazard indoors, outdoors or in sewers. Those substances designated with a (P) may polymerize explosively when heated or involved in a fire. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Many liquids will float on water. (ERG, 2024)

Health Hazard

Excerpt from ERG Guide 130 [Flammable Liquids (Water-Immiscible / Noxious)]:

May cause toxic effects if inhaled or absorbed through skin. Inhalation or contact with material may irritate or burn skin and eyes. Fire will produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or asphyxiation, especially when in closed or confined areas. Runoff from fire control or dilution water may cause environmental contamination. (ERG, 2024)

Reactivity Profile

XYLENE reacts exothermically with sulfuric acid, nitric acid, and strong oxidizing agents [Handling Chemicals Safely 1980. p. 962].

Belongs to the Following Reactive Group(s)

- Hydrocarbons, Aromatic

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 130 [Flammable Liquids (Water-Immiscible / Noxious)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area for at least 50 meters (150 feet) in all directions.

LARGE SPILL: Consider initial downwind evacuation for at least 300 meters (1000 feet).

FIRE: If tank, rail tank car or highway tank is involved in a fire, **ISOLATE** for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 130 [Flammable Liquids (Water-Immiscible / Noxious)]:

CAUTION: The majority of these products have a very low flash point. Use of water spray when fighting fire may be

inefficient.

SMALL FIRE: Dry chemical, CO₂, water spray or regular foam. If regular foam is ineffective or unavailable, use alcohol-resistant foam.

LARGE FIRE: Water spray, fog or regular foam. If regular foam is ineffective or unavailable, use alcohol-resistant foam. Avoid aiming straight or solid streams directly onto the product. If it can be done safely, move undamaged containers away from the area around the fire.

FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 130 [Flammable Liquids (Water-Immiscible / Noxious)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A vapor-suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean, non-sparking tools to collect absorbed material.

LARGE SPILL: Dike far ahead of liquid spill for later disposal. Water spray may reduce vapor, but may not prevent ignition in closed spaces. (ERG, 2024)

Protective Clothing

Excerpt from ERG Guide 130 [Flammable Liquids (Water-Immiscible / Noxious)]:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing provides thermal protection but only limited chemical protection. (ERG, 2024)

DuPont Tychem® Suit Fabrics

Normalized Breakthrough Times (in Minutes)

Chemical	CAS Number	State	QS	QC	SL	C3	TF	TP	RC	TK	RF
Xylene, mixed isomers	1330-20-7	Liquid				>480	>480	>480	>480	>480	>480
Xylene, o-	95-47-6	Liquid				>480					

> indicates greater than.

Special Warning from DuPont: Tychem® and Tyvek® fabrics should not be used around heat, flames, sparks or in potentially flammable or explosive environments. Only...

(DuPont, 2024)

First Aid

Excerpt from ERG Guide 130 [Flammable Liquids (Water-Immiscible / Noxious)]:

Refer to the "General First Aid" section. Specific First Aid: Wash skin with soap and water. In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin. (ERG, 2024)

Physical Properties

Chemical Formula: C₈H₁₀

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: data unavailable

Vapor Pressure: data unavailable

Vapor Density (Relative to Air): data unavailable

Specific Gravity: data unavailable

Boiling Point: data unavailable

Molecular Weight: data unavailable

Water Solubility: data unavailable

Ionization Energy/Potential: 8.56 eV [From NPG: o-Xylene] (NIOSH, 2024)

IDLH: 900 ppm [From NPG: o-Xylene] (NIOSH, 2024)

AEGLs (Acute Exposure Guideline Levels)

Final AEGLs for Xylenes (1330-20-7)

Exposure Period	AEGL-1	AEGL-2	AEGL-3
10 minutes	130 ppm	2500 ppm 	7200 ppm  
30 minutes	130 ppm	1300 ppm 	3600 ppm 
60 minutes	130 ppm	920 ppm 	2500 ppm 
4 hours	130 ppm	500 ppm	1300 ppm 
8 hours	130 ppm	400 ppm	1000 ppm 

Lower Explosive Limit (LEL) = 9000 ppm

 indicates value is 10-49% of LEL. Safety consideration against explosions must be taken into account.

  indicates value is 50-99% of LEL. Extreme safety consideration against explosions must be taken into account.

(NAC/NRC, 2024)

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3	
Xylenes (1330-20-7)	130 ppm	920 ppm 	2500 ppm 	LEL = 9000 ppm
Xylene, m- (includes o- (95-47-6) and p- (106-42-3) isomers) (108-38-3)	130 ppm	920 ppm	2500 ppm 	LEL = 11000 ppm

 indicates value is 10-49% of LEL.

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Benzene, m- dimethyl-	108-38-3			1000 pounds	X	U239	
Benzene, o- dimethyl-	95-47-6			1000 pounds	X	U239	
Benzene, p- dimethyl-	106-42-3			100 pounds	X	U239	
Xylene (mixed isomers)	1330-20-7			100 pounds	313	U239	
m-Xylene	108-38-3			1000 pounds	313	U239	
o-Xylene	95-47-6			1000 pounds	313	U239	
p-Xylene	106-42-3			100 pounds	313	U239	

"X" indicates that this is a second name for an EPCRA section 313 chemical already included on this consolidated list. May also indicate that the same chemical with the same CAS number appears on another list with a different chemical name.

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- BENZENE, M-DIMETHYL-
- BENZENE, O-DIMETHYL-
- BENZENE, P-DIMETHYL-
- DILAN
- 1,4-DIMETHYL BENZENE
- DIMETHYLBENZENE
- 1,2-DIMETHYLBENZENE
- 1,3-DIMETHYLBENZENE
- 1,4-DIMETHYLBENZENE
- DIMETHYLBENZENES
- M-DIMETHYLBENZENE
- M-METHYLTOLUENE
- M-XYLENE
- M-XYLOL
- META-XYLENE
- 2-METHYLTOLUENE
- 4-METHYLTOLUENE

- O-DIMETHYLBENZENE
- O-METHYLTOLUENE
- O-XYLENE
- O-XYLOL
- ORTHO-XYLENE
- ORTHOXYLENE
- P-DIMETHYLBENZENE
- P-METHYLTOLUENE
- P-PHENYLENEBIS(METHYLENE)
- P-XYLENE
- P-XYLOL
- PARA-XYLENE
- XYLENE
- XYLENE (MIXED ISOMERS)
- XYLENE, [MIXED ISOMERS]
- 1,2-XYLENE
- 1,3-XYLENE
- 1,4-XYLENE
- XYLENES
- XYLENES (META-XYLENE)
- XYLENES (ORTHO-XYLENE)
- XYLENES (ORTHO-XYLENE, META-XYLENE, PARA-XYLENE)
- XYLENES (PARA-XYLENE)
- XYLOL



CAMEO Chemicals



Chemical Datasheet

ZINC DUST



Chemical Identifiers

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
7440-66-6	1436	Dangerous When Wet Spontaneously Combustible	none
NIOSH Pocket Guide		International Chem Safety Card	
none		ZINC POWDER	

NFPA 704

data unavailable

General Description

A grayish powder. Insoluble in water. May produce toxic zinc oxide fumes when heated to very high temperatures or when burned. Used in paints, bleaches and to make other chemicals.

Hazards

Reactivity Alerts

Strong Reducing Agent
Known Catalytic Activity
Water-Reactive
Pyrophoric

Air & Water Reactions

Can evolve gaseous hydrogen in contact with water or damp air. The heat of the reaction may be sufficient to ignite the hydrogen produced [Haz. Chem. Data 1966. p. 171]. Flammable. May form an explosive mixture with air [Hawley].

Fire Hazard

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

Produce flammable gases on contact with water. May ignite on contact with water or moist air. Some react vigorously or explosively on contact with water. May be ignited by heat, sparks or flames. May re-ignite after fire is extinguished. Some are transported in highly flammable liquids. Runoff may create fire or explosion hazard. (ERG, 2024)

Health Hazard

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

Inhalation or contact with vapors, substance or decomposition products may cause severe injury or death. May produce corrosive solutions on contact with water. Fire will produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may cause environmental contamination. (ERG, 2024)

Reactivity Profile

ZINC DUST is a reducing agent. Reacts violently with oxidants causing fire and explosion hazards [Handling Chemicals Safely 1980, p. 966]. In the presence of carbon, the combination of chlorine trifluoride with zinc results in a violent reaction [Mellor 2, Supp. 1: 1956]. Sodium peroxide oxidizes zinc with incandescence [Mellor 2:490-93 1946-47]. Zinc powder or dust in contact with acids forms hydrogen. The heat generated by the reaction is sufficient to ignite the hydrogen evolved [Lab. Govt. Chemist 1965]. A mixture of powdered zinc and an oxidizing agent such as potassium chlorate or powdered sulfur can be exploded by percussion. Zinc burns in moist chlorine. A mixture of zinc and carbon disulfide reacts with incandescence. Zinc powder reacts explosively when heated with manganese chloride. The reaction between zinc and selenium or tellurium is accompanied by incandescence [Mellor 4:476-480 1946-47]. When zinc and ammonium nitrate are mixed and wetted with a minimum of water, a violent reaction occurs with evolution of steam and zinc oxide. When hydrazine mononitrate is heated in contact with zinc a flaming decomposition occurs at temperatures a little above its melting point. Hydroxylamine is reduced when heated with zinc dust, unpredictably it may either ignite and burn or explode [Mellor 8 1946-47].

Belongs to the Following Reactive Group(s)

- Metals, Elemental and Powder, Active

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

LARGE SPILL: Consider initial downwind evacuation for at least 300 meters (1000 feet).

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

DO NOT USE WATER OR FOAM.

SMALL FIRE: Dry chemical, soda ash, lime or sand.

LARGE FIRE: DRY sand, dry chemical, soda ash or lime or withdraw from area and let fire burn. If it can be done safely, move undamaged containers away from the area around the fire.

FIRE INVOLVING METALS OR POWDERS (ALUMINUM, LITHIUM, MAGNESIUM, ETC.): Use dry chemical, DRY sand, sodium chloride powder, graphite powder or class D extinguishers; in addition, for Lithium you may use Lith-X® powder or copper powder. Also, see ERG Guide 170.

FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material. **DO NOT GET WATER** on spilled substance or inside containers.

SMALL SPILL: Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain. Dike for later disposal; do not apply water unless directed to do so.

POWDER SPILL: Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry. **DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.** (ERG, 2024)

Protective Clothing

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

Wear positive pressure self-contained breathing apparatus (SCBA). Wear chemical protective clothing that is specifically recommended by the manufacturer when there is **NO RISK OF FIRE**. Structural firefighters' protective clothing provides thermal protection but only limited chemical protection. (ERG, 2024)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

Refer to the "General First Aid" section. Specific First Aid: In case of contact with substance, wipe from skin immediately; flush skin or eyes with running water for at least 20 minutes. (ERG, 2024)

Physical Properties

Chemical Formula: Zn

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: data unavailable

Vapor Pressure: data unavailable

Vapor Density (Relative to Air): data unavailable

Specific Gravity: data unavailable

Boiling Point: data unavailable

Molecular Weight: data unavailable

Water Solubility: data unavailable

Ionization Energy/Potential: data unavailable

IDLH: data unavailable

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Zinc (7440-66-6)	0.3 mg/m3	40 mg/m3	240 mg/m3

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Zinc ††	7440-66-6			1000 pounds			
Zinc (fume or dust)	7440-66-6			1000 pounds	313		
Zinc Compounds	N982			&	313		

†† indicates that no reporting of releases of this CERCLA hazardous substance is required under CERCLA if the diameter of the pieces of the solid metal released is larger than 100 micrometers (0.004 inches).

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- ASARCO L 15
- BLUE POWDER
- ECKA 4

- F 1000
- F 1000 (METAL)
- F 2000
- F 2000 (METAL)
- LS 2
- LS 2 (ELEMENT)
- LS 4
- LS 5
- RHEINZINK
- UF
- UF (METAL)
- VM 4P16
- ZINC
- ZINC (FUME OR DUST)
- ZINC DUST
- ZINC METAL, [POWDER OR DUST]
- ZINC POWDER



SAMPLING & ANALYSIS PLAN/ QUALITY ASSURANCE PROJECT PLAN

Lovric's Sea-Craft
3100 Oakes Avenue
Anacortes, Washington 98221
Facility Site ID #21847524

Prepared For:

Guemes Channel Holdings, LLC

By:



PO Box 2546
Bellingham, WA 98227
(360) 714-9409

January 15, 2025

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APPENDICES

APPENDIX I

Example Boring Log



January 15, 2025

PO Box 2546, Bellingham, WA 98227
Phone: (360) 714-9409

Kelly Allison
Guemes Channel Holdings, LLC
2629 NW 54th, Suite 201
Seattle, WA 98107

Re: Sampling & Analysis Plan/Quality Assurance Project Plan

Lovric's Sea-Craft
3100 Oakes Avenue
Anacortes, Washington 98221
Facility Site ID #21847524

Dear Ms. Allison:

This document presents a Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) developed as part of the Remedial Investigation Work Plan for the upland portion of the Lovric's Sea-Craft Site (Site) in Anacortes, Washington to investigate and characterize contamination on the Site per Agreed Order No. DE 22368.

Should you have any questions concerning this SAP/QAPP, please do not hesitate to contact us at (360) 714-9409.

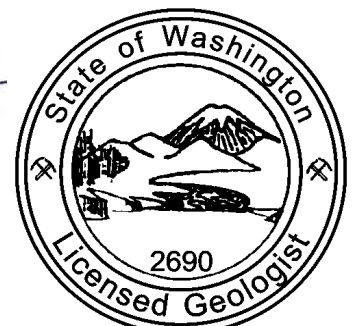
Sincerely,
Stratum Group


Ben Carlson, M.Sc., L.G.
Licensed Geologist



Benjamin Carlson


Kim Ninnemann, B.S.
Licensed Geologist



KIM N NINNEMANN

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) was prepared to present a detailed description of the field and laboratory procedures to be used for sampling and sample analysis at the Lovric's Sea Craft site (Site). This work is being completed as part of the Remedial Investigation (RI) under Agreed Order No. DE 22368. This SAP/QAPP was prepared for compliance with Washington Administrative Code (WAC) 173-340-820. The goal of this RI is to establish the nature and extent of potential contaminants of concern (COCs) in soil and groundwater at the Site. Project activities described herein are anticipated to commence in early 2025 in accordance with the proposed project schedule presented in the RI Work Plan.

This SAP/QAPP was prepared in accordance with the Guidance for Preparation of Quality Assurance Project Plans, U.S. Environmental Protection Agency (EPA) Region 10, Quality Data Management Program (EPA, 2002) and the Washington State Department of Ecology's Guidelines for preparing Quality Assurance Project Plans for Environmental Studies (Ecology, 2016).

2.0 PROJECT BACKGROUND

2.1 Purpose

The purpose of this RI is to define the nature and extent of upland contamination on the Site such that plans for Site remediation and mitigation can begin to be designed. The goal of this SAP/QAPP is to describe in detail the procedures for sample collection, sample analysis, and project quality assurance and quality control to demonstrate that data collected in this investigation will be sufficient to meet the project goals and that the data collected can be relied upon.

Previous environmental work on the Site has identified the following data gaps that need to be addressed by the RI in order to fully characterize and understand the nature and extent of contamination on the Site.

- Insufficient characterization of petroleum contamination of soil and groundwater around the former fuel oil USTs. Previous sampling did not sufficiently analyze samples for oil-range petroleum and no groundwater samples were collected.
- Insufficient characterization of potential contamination within nearshore fill zones.
- Insufficient characterization of shallow soil impacts in association with petroleum spills and weathering of metallic junk and creosote piles across high traffic areas and storage areas on the upland areas of the Site.
- Potential releases from the former used oil storage tank between the east warehouse and the tin building.



- Potential releases of paints and solvents around the former paint shed.
- Potential boat maintenance-related contamination around the marine railways, including underneath the concrete pads that underlie the railways and the metal fabrication shed.
- Potential releases (primarily petroleum) by former oily bilge water storage areas between the west warehouse and west railways.
- Potential contamination of fill soils where buried creosote piles have been identified and removed.

2.2 Property Location

The Property, defined as the parcels of real property that make up the Site, is located within the city limits of Anacortes, Washington in Skagit County. The Property is located on the north shore of Fidalgo Island approximately 1.4 miles west-southwest of the historical downtown core of Anacortes, between Dakota Avenue to the east and Hartford Avenue to the west. The Property business utilizes the street address 3100 Oakes Avenue, but the property is also recognized under the addresses 3006 Oakes Avenue, 3022 Oakes Avenue, and 1100 Dakota Avenue. The location of the Property is presented in Figure 1 in Appendix I of the RI Work Plan.

The Property covers approximately 8.7 acres, portions of which are submerged below the high-water mark of Guemes Channel to the north. The upland consists of a steep vegetated hillside and a relatively level shoreline commercial area that is developed with multiple buildings and marine railways. The elevation of the Property along Oakes Avenue is approximately 70 feet above mean sea level, with a steep 50-to-60-foot elevation drop to the nearshore and shoreline areas where the shipyard infrastructure development is present.

2.3 Development and Use History

The Property has been developed since at least the late 1890s, when the Russian Cement plant was constructed. The business produced glue, fertilizer, and fish oil from fish waste gathered from nearby canneries. Robinson Fisheries established a cod cannery on the west side of the Property circa 1912. The entire Property is believed to have operated as a fish processing facility through the mid-1960s.

Lovric's Sea-Craft shipyard was established on the Property by 1965. Shipyard activities are apparent on the Property by 1969. Significant filling of the waterfront areas of the Property occurred in the late 1970s and 1980s to create many of the existing flat areas surrounding the two main warehouses. The fill reportedly consists of a mix of marine dredge spoils and upland-derived fill. The Property has been in continuous operation as a shipyard since the mid-1960s, with activities including engine repair and maintenance, welding, painting, sandblasting, replacement of sacrificial anodes, boat upfitting, and general boat maintenance services.

2.4 Key Site Features

A variety of structures are located on the Site which were constructed over a period of time by



prior owners to facilitate site uses including fish processing, a shipyard, and a marina.

Structures and key physical elements of the Site include the following:

- **West Breakwater** – A west breakwater consisting of upland fill with rip rap slopes. A portion of the breakwater was created from a large ship backfilled with fill material. The outer portion of the breakwater was created from a barge backfilled with fill material. The West Breakwater was constructed in the mid to late 1960s.
- **Recreational Marina** – A small boat marina consisting of floating docks and anchor pilings surrounded by rip rap shoreline. The Marina area was dredged, and floats were constructed in the mid to late 1960s following the installation of the West Breakwater.
- **Bulkheads** – Various timber, rip rap, and concrete bulkheads exist along the shoreline. These include the West Warehouse Bulkhead, Marine Railway Bulkheads, and East Warehouse Bulkhead.
- **West Peninsula** – A west peninsula consisting of upland fill with rip rap slopes is located to the east of the small boat marina and the west of the central peninsula and west warehouse. This area was created from a large barge backfilled with fill material. The West Peninsula was created in the early to mid-1960s.
- **Center Peninsula and Pier** – A center peninsula and pile-supported pier consisting of an upland area with rip rap slopes on the nearshore end and a concrete and timber-pile supported pier structure at the outer end. The existing land portion of the central peninsula is approximately 205 feet long and 50 feet wide. The center peninsula includes a large barge that was backfilled in between the rip rap slopes. The existing timber pile-supported central pier is approximately 26 feet wide and 105 feet long. The timber pier structure is in deteriorated condition. Approximately nine older concrete pilings were used to repair the timber pier in the past. The Center Peninsula and Pier appear to have been constructed in the late 1960s.
- **Marine Railway Facility** – Two marine railways consisting of steel rails supported by timber piling, which may be set on timber piles, concrete footings or gravel base. The marine railways are used to haul out and work on ships. The area around the perimeter of the railway facility consists of soil, rip rap, and concrete bulkheads. The center area between the two railways consists of a shed built on an old barge. The small (west) railway was built in the mid-1960s, and the large (east) railway was built in the mid to late 1930s.
- **East Pier** – An east pier constructed in the early to mid-1990s of timber pilings and timber superstructure with a concrete deck. The east pier varies in width and is approximately 315 feet long. The east pier is in deteriorated condition.
- **Floating Pontoon Breakwater** – The east pier connects via a vehicle gangway steel ramp to an outer concrete-pontoon floating moorage and breakwater system placed on the property in the early to mid-1990s. The floating concrete pontoon system is in good condition. The pontoon system is anchored to piles and anchors via a chain system.
- **Commercial Marina** – The water area of the facility around the floating pontoons, east pier, central pier, and marine railway facility that is used for maneuvering and moorage



- of vessels within the shipyard facility.
- **Parking and Equipment Storage** – There is an existing asphalt roadway from Oakes Avenue down the west side of the property. The roadway transitions from asphalt to gravel as it moves from west to east. Gravel and soil areas on the site are utilized for vehicle parking and equipment storage.
- **West Warehouse** – A three story wood framed building built in approximately 1913 and totaling approximately 21,000 square feet is located on the west side of the property. The West Warehouse was constructed on a pile foundation that has been backfilled behind the bulkhead wall.
- **East Warehouse** – A four story wood frame building built in approximately 1962 and totaling approximately 34,000 square feet. The building is constructed on a pile foundation with reinforced concrete pile caps.
- **Tin Building** – A two-story wood-framed building of approximately 4,300 square feet. The building is sided with metal corrugated panel siding and constructed with concrete footings and slab.
- **Utilities** – The site has limited utility infrastructure. Due to the age of the facility, it has no sewer or storm water management system. In addition, the power infrastructure is insufficient to provide commercial vessels with adequate shore power and support modern shipyard activities.

These site feature names will be used as reference points throughout this SAP and the RI to aid in the description of sampling locations. An annotated aerial photograph of the Property with key site features labeled is provided in Figure 2 in Appendix I of the RI Work Plan.

3.0 PROJECT ORGANIZATION

Ben Carlson of Stratum Group will be the primary Project Manager responsible for development and implementation of the RI Work Plan and this SAP/QAPP, including fieldwork coordination, sample collection and delivery to the laboratory, and assessment and evaluation of the laboratory data. The primary Project Manager will also be responsible for the implementation of the project Health and Safety Plan. Kim Ninnemann of Stratum Group will be the assistant Project Manager in support of these efforts.

Fridman & Bruya Laboratory (F&B) will be the primary analytical laboratory responsible for sample analysis. Analytical Resources Inc (ARI) will be the secondary analytical laboratory responsible for completion of sample analysis that F&B is unable or uncertified to complete. Friedman & Bruya will be responsible for forwarding potentially contaminated media and data to ARI as needed.

Additional key project personnel and entities are outlined in Table 1, below.



Table 1. Project Personnel & Contact Information

Name	Organization	Contact	Responsibilities
Ben Carlson	Stratum Group	978-857-0728 ben@stratumgroup.net	Primary Project Manager including coordination & oversight of subcontractors, HASP implementation, sample collection, evaluation of analytical results, reporting, & general QA/QC compliance
Kim Ninnemann	Stratum Group	360-920-0468 kim@stratumgroup.net	Assistant Project Manager
David Horne	WA Department of Ecology	360-742-1091 hoda461@ecy.wa.gov	Ecology Site Manager
Kelly Allison	Stabbert Maritime & Industrial	425-736-9819 kellya@stabbertmaritime.com	Project Manager for GCH (property owner)
Eric Young	Friedman & Bruya Laboratory	206-683-1731 eyoung@friedmanandbruya.com	Laboratory Director responsible for management and execution of analytical laboratory work and QA/QC
Anisa Harnden	Holocene Drilling	253-848-6500 aharnden@holocenedrilling.com	Direct-push drilling & soil & groundwater recovery
Larry Gasser	CNI Locates	253-826-1177	Private utility locator
	EcoChem or Laboratory Data Consultants	206-233-9332 760-827-1100	3 rd party data verification and validation for QA/QC

4.0 SOIL & GROUNDWATER SAMPLING PLAN

Soil and groundwater sampling will be completed for this RI via a combination of surface soil sampling using hand tools and subsurface soil and groundwater sampling using direct-push drilling equipment.

4.1 Sampling Locations

A total of 18 soil borings and eight surface sampling locations are proposed in this investigation. Prior to completion of each boring, one surface soil sample will be collected from the upper ~4-6 inches at that location using hand tools (see Section 4.4). Surface samples will not be collected where the surface is currently covered by an impermeable surface (e.g., concrete). This includes locations SB10, SB11, and SB13.

Rationale for each of the boring locations is provided in Table 2, below. Maps indicating the proposed sampling locations are provided as Figures 1-5 and 1-6 in Appendix I of the RI Work Plan.



Table 2. Boring Location Rationale

Boring ID	Location	Rationale
SB1	N of former UST area	Evaluate northern, eastern, and western extent of petroleum contamination from former fuel oil USTs
SB2	E of former UST area	
SB3	W of former UST area	
SB4	Alcove between E Warehouse and tin building	Evaluate suspected petroleum contamination related to surface spills from former waste oil storage. Evaluate southern extent of petroleum contamination from former fuel oil USTs.
SB5	SE corner of E Warehouse	Evaluate suspected petroleum contamination beneath former metal press/oil filter crusher
SB6	NW corner of E Warehouse	Evaluate fill thickness and potential contamination within fill material
SB7	Storage area W of E Warehouse	Evaluate residual soil conditions beneath the former fill soil stockpile
SB8	Adjacent to active equipment fueling area and former scrap storage	Evaluate extent of contamination identified in 2022 investigation (SG-2)
SB9		
SB10	N of metal fabrication shed	Evaluate potential contamination associated with long term metal fabrication and boat repair activities
SB11	Through E railways	Evaluate potential contamination associated with long term boat repair activities
SB12	Work area between the railways	Evaluate potential contamination associated with long term boat repair activities and junk storage
SB13	Through W railways	Evaluate potential contamination associated with long term boat repair activities
SB14	Former bilge water storage area on east side of W Warehouse	Evaluate potential contamination associated with oily water storage
SB15	Through former paint shed	Evaluate potential contamination associated with former paint, thinner, and solvent storage.
SB16	N edge of slope in former creosote timber fill area	Evaluate residual soil for contamination associated with fill and former buried creosote timbers
SB17	W side of the bottom of the main driveway	Evaluate potential contamination in former location of hazardous waste semi-trailer
SB18	S edge of W gravel driveway extension	Evaluate potential contamination associated with long term equipment and junk storage

4.2 Sample Labelling

All sample containers will be laboratory supplied and affixed with a sampling label. Each sample label will include the site name (Lovric's) and the date and time of sample collection.



Soil samples will be collected from surface locations and from cores retrieved through push probe drilling. Surface soil samples collected in locations where a boring will not be advanced will be labeled SS(ID#). Surface samples collected in locations where a boring will be advanced will be labeled "Boring ID – Surface". For example, a surface sample collected from the location of boring SB5 would be labeled SB5-Surface. Subsurface soil samples collected from borings will be labeled "Boring ID – Depth". For example, a subsurface sample collected from boring SB5 and 10 feet bgs would be labeled SB5-10.

Groundwater samples will be collected from temporary wells installed in the boring locations. The groundwater samples will be labeled with the boring identification following by a "W". For example, a water sample from SB5 would be labeled SB5-W.

4.3 Field Screening

Surface soils at the proposed surface sampling locations and soils recovered from the borehole will be examined for field evidence of environmental impacts prior to sampling. Field screening techniques may include inspecting the soil for staining or discoloration, human-derived debris, sheens, or unusual odors. Any such indicators, if observed, will be recorded on boring logs.

A MiniRAE 3000 photoionization detector (PID) equipped with a 10.6eV lamp will be utilized to field scan samples for volatile organic compounds (VOCs). The PID is calibrated regularly in accordance with the manufacturer's specifications using a hexane or isobutylene standard. An initial scan of each soil core will be completed by running the tip of the PID over the length of the core and observing for any spikes in PID readings.

More detailed PID readings will be collected from zones where spikes are noted, or approximately every 2.5 feet in the soil core. To evaluate for VOCs with the PID, soil is placed into a sealed plastic bag and allowed to sit for approximately 5 minutes. The PID sampler tip is then inserted into the headspace of the plastic bag to retrieve a parts per million (ppm) concentration of VOCs. Measurements obtained from the PID are recorded on the boring log.

When field screening of soil indicates the potential presence of contaminants of concern (COCs) at an interval not specified for sampling in the RI work plan, an additional soil sample will be collected at that interval for analysis, and a record of the depth(s) of the soil sample will be recorded. However, any sampling locations selected based upon field observations will be additional and will not supplant the proposed sampling depth intervals described in Section 4.5, below.

The PID data is also used in conjunction with laboratory sample data from the same depths, so that a correlation between field observations and laboratory determined concentrations can be developed and used in future field work at the site.

Purge water from each temporary well will be observed for evidence of sheen, odor, and discoloration. Observations will be recorded on the boring log. Please refer to Section 8.3 of the RI



Work Plan for a discussion of soil sampling locations and rationale, sampling intervals, and analytical methods.

4.4 Surface Soil Sampling

Prior to sampling, a photograph will be taken of the location to be sampled.

A shallow hole will be dug using hand tools (shovel, breaker bar). Surface soil samples will be collected by Stratum Group field personnel from the upper 4 to 6 inches of the sidewall of the hand-dug hole using laboratory-provided plastic syringes and stainless steel spoons. If the soil is too dense to be sampled in place, the spoon may be used to loosen soils such that sample collection becomes possible.

The sampled soil will be described according to the Unified Soil Classification System (USCS), with particular note to presence of color, moisture content, presence of debris and/or indicators of contamination. These descriptions are recorded on a boring log.

Samples will be placed into an ice-chilled cooler immediately after sampling and delivered to a Washington State Department of Ecology accredited laboratory for analysis. The samples will be transferred under chain-of-custody protocol.

4.5 Subsurface Soil Sampling

Stratum Group engages a professional drilling company, and a driller licensed in the State of Washington to complete subsurface soil borings with a truck- or track-mounted direct-push drill rig. All drilling activities will be monitored and directed by a Stratum Group environmental professional.

Prior to all drilling activities, available utility maps will be consulted to identify the location(s) of Site utility lines. At least two business days prior to the initiation of ground disturbing activities, Stratum Group personnel will notify the Washington One-Call Notification Service for a public utility locate. Stratum Group will also engage a private utility locating service provider to confirm the location of marked utilities, look for additional underground utilities suspected to be on site, and clear each boring location of subsurface obstructions. Findings from these locating investigations will inform final boring location selection.

Following collection of surface soil samples, drilling will progress in 5-foot intervals using 5-foot-long stainless-steel Macro-Core direct push tooling with a 2 inch-diameter plastic liner. Following each 5-foot run, the drill rods will be removed from the borehole and the liner will be extracted from the drill rods. The liner will be cut open lengthwise and described in accordance with the Unified Soil Classification System (USCS), with particular note to presence of colors, moisture content, presence of debris and/or indicators of contamination. These descriptions are recorded on a boring log.



A minimum of three soil samples will be collected from each boring location, except as described below:

- One sample from fill material between 0 to 5 feet bgs (~3 feet bgs)
- One sample from fill material between 5 and 10 feet bgs (~7 feet bgs)
- One sample from underlying native soil/fill (~10 feet bgs)

If fill material greater than 10 feet thick is encountered, one additional soil sample will be collected from fill between 10 and 15 feet bgs. Samples will be collected where historical research and field evidence suggest contamination is most likely to be present. Obvious field indications of contamination may be used to adjust sampling depths and/or inform additional sampling depths during field activities.

For location SB10, one shallow soil sample will be collected from the upper 1 foot of the soil column beneath the concrete slab, one sample will be collected from deeper fill material, and one sample will be collected from underlying native soil.

Fill material beneath the marine railways is anticipated to be very thin compared to the rest of the Site. Therefore, for borings completed through the marine railways (SB11 and SB13), one shallow soil sample will be collected from the upper 1 foot of the soil column beneath the concrete slab and one sample will be collected from underlying native soil. If thicker than anticipated fill material is encountered, one additional soil sample will be collected from within the zone of fill material.

All planned borings will be completed to a depth of approximately 15 feet below the ground surface (bgs), with the goal being to advance each boring at least 3 feet below the water table and 3 feet into native soil. If either of these criteria are not met, the boring will be advanced further until a depth of 3 feet into native soil is achieved or the drill rig encounters refusal. Additionally, if contamination is suspected at the base of the boring through field testing, then the boring will be extended until field indicators indicate contamination is not present or the drill rig encounters refusal.

After completion of each boring, a photograph will be taken of the drilling location and of the soil core.

Borings proposed in the RI Work Plan are to be completed solely for collection of soil and reconnaissance groundwater samples. No construction of permanent monitoring wells is planned at this time.

4.6 Soil Sample Collection

Soil samples collected for analysis of non-volatile parameters (e.g., metals, PCBs, cPAHs, diesel- and oil-range petroleum) will be collected from the desired sampling interval using a clean stainless-steel spoon and placed into the appropriate laboratory-supplied 4oz soil jar.



At sampling locations and depths where volatile parameters will be analyzed (e.g., gasoline-range petroleum, VOCs), one 4oz soil jar and a set of four 40mL vials (three with a methanol preservative) will be filled. The sample containers will be collected in accordance with US EPA Method 5035A, which is designed to reduce volatilization and biodegradation in samples. Samples for volatiles analyses will be collected as soon as possible after the liner is cut open. Approximately 4 to 5 mL of soil will be collected from the soil core using a disposable plastic syringe and the sample will be extruded into the laboratory-supplied 40 mL vials.

The ground surface at the Site is known to be very dense and may not be possible to penetrate with a plastic syringe. An attempt will be made to collect in-place near-surface soil for volatiles analysis by pressing the plastic syringe into the sidewall of the hand-dug hole. If the syringe is unable to penetrate the sidewall, soil will be loosened and gathered with a clean stainless-steel spoon, placed into a laboratory-supplied jar, the syringe will be inserted into the soil jar, and the extracted sample will be transferred into the appropriate vials as described above.

Samples will be placed into an ice-chilled cooler immediately after sampling and maintained at a temperature at or below 4°C until they can be delivered to the laboratory. The samples will be transferred under chain-of-custody protocol.

4.7 Reconnaissance Groundwater Sample Collection

If groundwater is encountered during soil boring completion, a reconnaissance groundwater sample will be collected using a temporary well placed into the completed borehole. Temporary wells are constructed using single-use, slotted, 1-inch-diameter PVC pipe placed in the depth range of desired groundwater sampling. Blank pipe rises from the top of the slotted "screen" to the surface. The screen length and placement depth are noted on the boring logs. Temporary well materials will be disposed after each borehole to prevent cross contamination.

Prior to well purging or sample collection, the depth of the groundwater table in the borehole will be measured using a depth-to-water meter. Water will then be purged from the well using a low-flow peristaltic pump. The temporary well will be purged for a minimum of 10 minutes prior to sample collection or until turbidity is greatly reduced and changes in visual clarity of purge water stabilizes. If low water levels or low conductivity aquifers result in the temporary wells pumping dry during purging, purging will halt, and the well will be allowed to recharge until it can be purged again. Multiple rounds of purging and recharging may be completed to allow for turbidity to decrease significantly. The total volume of purge water and notes regarding the color, turbidity and presence of obvious indications of contamination (e.g., odors, sheens) will be noted on the boring log.

Reconnaissance groundwater samples will be collected directly into the appropriate laboratory supplied containers. Containers for volatiles analysis will be filled completely so that no head space remains.

Reconnaissance groundwater samples will be immediately placed into an ice-filled cooler and



maintained at a temperature at or below 4°C until they can be delivered to the laboratory.

Tubing used for well purging and sample collection is single-use and is discarded after sample collection to prevent cross contamination.

4.8 Boring Decommissioning

Borings proposed in this investigation will not be completed as monitoring wells. Therefore, upon completion of any sampling activities, the borings will be decommissioned in accordance with Washington State regulations for resource protection wells (WAC 173-160-460). Per the code, each soil boring not completed as a monitoring well will be decommissioned by sealing the boring from the bottom to the ground surface using bentonite chips, bentonite slurry, neat cement grout, or neat cement. The ground surface will be returned to its original condition to match the surrounding ground surface areas after decommissioning soil borings, including surface patching of asphalt or cement to match the surrounding surface, if applicable.

4.9 Decontamination Procedures

Downhole drilling equipment and the water level indicator will be washed with Alconox and triple rinsed with deionized water between each boring. Hand tools used for surface sampling will be similarly washed and rinsed between each sampling location.

Single-use sampling equipment including sampling syringes and gloves will be disposed of after collection of each sample. Sampling equipment used once per boring (e.g., soil boring liners, temporary well piping, groundwater sample tubing) will be disposed of between each borehole.

4.10 Management of Investigation Derived Waste (IDW)

All soil and water generated from environmental borings that is not used for sample analysis purposes and any decontamination fluid will be placed in labeled 55-gallon drums and stored on-site pending characterization. We anticipate this waste will be stored on-site until cleanup activities commence, at which time the soil and water will be disposed of with soil and water removed during remediation.

Waste personal protective equipment (e.g., gloves) and field supplies (e.g., plastic bags for PID testing) will be bagged and disposed of as general solid waste at the end of each field day.

5.0 LABORATORY SAMPLE ANALYSIS PLAN

Soil and reconnaissance groundwater samples will be delivered or mailed to a laboratory with Department of Ecology accreditation for the required analysis. Friedman & Bruya Laboratory (F&B) of Seattle, Washington (accreditation C578) will be the primary lab for sample analysis. Analysis for substances that F&B is not accredited for (e.g., tributyltin) will be forwarded on to



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Analytical Resources, LLC of Tukwila, Washington (C558). F&B will be responsible for ensuring that all laboratory analytical work for soil and water samples complies with project requirements and will promptly communicate any problems or concerns with the analytical laboratory work with Stratum Group.

The proposed analytical schedule is provided in Table 3, below, including the methodology recommended for the analysis.



Table 3. Sample Analysis Plan

Boring	Sample Description	Contaminants of Concern	Analytical Method
SB1 through SB3	4 soil samples (surface, 3 subsurface) & 1 reconnaissance groundwater sample per boring	Diesel & Oil	NWTPH-Dx
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
SB4	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	Diesel & Oil	NWTPH-Dx
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
		VOCs	EPA 8260D
		PCBs	EPA 8082A
SB5	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	Diesel & Oil	NWTPH-Dx
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
SB6 & SB7	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample per boring	HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
SB8 & SB9	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	Diesel & Oil	NWTPH-Dx
		Gasoline	NWTPH-Gx
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
SB10	3 subsurface soil samples & 1 reconnaissance groundwater sample	HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		Tributyltin	EPA 8270E-SIM
SB11 & SB13	2 subsurface soil samples & 1 reconnaissance groundwater sample per boring	HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		Tributyltin	EPA 8270E-SIM
SB12	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
		VOCs	EPA 8260D
		PCBs	EPA 8082A
		Tributyltin	EPA 8270E-SIM



Table 3. Sample Analysis Plan (continued)

Boring	Sample Description	Contaminants of Concern	Analytical Method
SB14	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
SB15	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
		VOCs	EPA 8260D
SB16	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	Tributyltin	EPA 8270E-SIM
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
SB17	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	PCBs	EPA 8082A
		HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
		cPAHs & naphthalene	EPA 8270E
SB18	4 soil samples (1 surface, 3 subsurface) & 1 reconnaissance groundwater sample	VOCs	EPA 8260D
		HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E
SS1 through SS8	1 surface soil sample per boring	cPAHs & naphthalene	EPA 8270E
		HCID	NWTPH-HCID
		MTCA 5 metals + Cu, Zn	EPA 6020B & 1631E

Samples will be preserved, if needed, in accordance with the sample QA/QC parameters outlined in Table 4, below.

In some locations where petroleum contamination is suspected purely due to general industrial activities on the Site and not due to a specific point source, we propose an initial petroleum screen using the hydrocarbon identification (HCID) analysis. If one or multiple hydrocarbon ranges are elevated based on the HCID analysis, then the sample will be further analyzed for specific hydrocarbon fractions (e.g., NWTPH-DX for diesel and oil, and/or NWTPH-GX and targeted VOCs for gasoline). If cases arise where BTEX constituents need to be analyzed to characterize a petroleum release and analysis of other VOCs is not needed, samples may be analyzed for BTEX by Method EPA 8021B.



Significant volumes of organic material have not been encountered in Site fill material during investigations completed to date. However, if areas of high organic content are encountered, and soil samples are found to contain elevated concentrations of diesel- and/or oil-range petroleum, samples may be reanalyzed for NWTPH-DX after being subjected to the silica gel cleanup (SGC) protocol. If deemed necessary based on field observations, application of SGC will be utilized to remove interference from non-petroleum polar organic material that may artificially bias sample results high.

Reconnaissance groundwater samples that will be analyzed for metals will be initially analyzed for total metals. If metals concentrations above the screening levels are detected from these analyses, the samples will be laboratory filtered and re-analyzed for dissolved metals.

6.0 Quality Assurance Project Plan (QAPP)

The purpose of the QAPP is to provide confidence in the analytical results through a system of quality assurance and quality control (QA/QC) checks with respect to data collection methods, laboratory analysis, data reporting, and corrective actions to achieve compliance with established performance and data quality criteria. This section presents the QA/QC protocols used to ensure that the data obtained during the investigation are defensible and usable for their intended purpose.

6.1 Sampling QA/QC

6.1.1 Monitoring Equipment Calibration

A portable photoionization detector (PID) will be used for screening soil vapor headspace in the field during sampling activities. Prior to the start of field activities, or after any gap of more than 30 days, the PID will be calibrated according to the manufacturer's recommended procedure using a laboratory-certified gas standard. The PID will also be field calibrated daily prior to the start of sampling activities. Routine checks of PID operation will be performed throughout each day's activities. The PID may be re-calibrated during the course of the day if field personnel identify inconsistencies with PID readings and field observations.

Field personnel will be properly trained in the use, calibration, and maintenance of all field meters used during this investigation.

6.1.2 Sample Collection

All sample containers will be provided by the laboratory. The specific container sizes and types, preservation requirements, and holding times are determined by the laboratory selected for this project, F&B. The sampling equipment needed for the desired analyses based on F&B's collection and preservation guidance is outlined in Table 4.



Additional sample collection will be completed for QA/QC purposes, including field duplicate samples and trip blanks.

Field duplicate samples consist of a set of two discrete samples collected at the same sampling location and depth during the same sampling period. Field duplicates are designed to assess actual variability in Site conditions. Field duplicate samples will be collected to meet the following criteria:

- 10% of soil samples and 10% of groundwater samples must have a field duplicate that is analyzed for the same analytes as the matching primary sample.
- 10% of samples analyzed by a given method must have a field duplicate that is analyzed.

Efforts will be made to collect the duplicate samples from locations where contamination is deemed likely to be present based upon field indicators, to evaluate sample variability more effectively.

Trip blanks are blank samples prepared by the laboratory and sent along with the field sampling equipment to assess transport conditions. One trip blank will accompany each sample cooler containing samples for VOCs analysis.

Table 4. Sampling Containers, Preservatives, and Holding Times

Sample Matrix	Analyte	Analytical Method	Sample Container(s)	Preservation	Holding Time*
Soil	HCID	NWTPH-HCID	3x 40mL VOA & 4 oz glass jar	Cool @ 4°C	14 days
	Oil/Diesel	NWTPH-Dx	4 oz glass jar	Cool @ 4°C	14 days
	Gas	NWTPH-Gx	3x 40mL VOA	Cool @ 4°C, MeOH preservative	14 days
	BTEX only	EPA 8021B	3x 40mL VOA	Cool @ 4°C	14 days
	SVOCs (cPAHs & naphthalenes)	EPA 8270E	4 oz glass jar	Cool @ 4°C	14 days
	Metals (As, Cd, Cr, Pb, Hg, Cu, Zn)	EPA 6020B/1631E	4 oz glass jar	Cool @ 4°C	28 days
	VOCs	EPA 8260D	3x 40mL VOA	Cool @ 4°C, MeOH preservative	14 days
	PCBs	EPA 8082	4 oz glass jar	Cool @ 4°C	14 days
	Tributyltin	EPA 8270E-SIM	4 oz glass jar	Cool @ 4°C	14 days

*Noted holding time refers to time from sampling to extraction, not analysis.



Table 4. Sampling Containers, Preservatives, and Holding Times (continued)

Sample Matrix	Analyte	Analytical Method	Sample Container(s)	Preservation	Holding Time*
Water	HCID	NWTPH-HCID	3x 40mL VOA & 500 mL amber glass bottle	Cool @ 4°C	14 days
	Oil/Diesel	NWTPH-Dx	500 mL amber glass bottle	Cool @ 4°C	14 days
	Gas	NWTPH-Gx	3x 40mL VOA	Cool @ 4°C, HCl preservative	14 days
	BTEX only	EPA 8021B	3x 40mL VOA	Cool @ 4°C	14 days
	SVOCs (cPAHs & naphthalenes)	EPA 8270E	1 L amber glass bottle	Cool @ 4°C	7 days
	Metals (As, Cd, Cr, Pb, Hg, Cu, Zn)	EPA 6020B/1631E	500 mL HDPE bottle	Cool @ 4°C, pH <2 HNO ₃	28 days
	VOCs	EPA 8260D	3x 40mL VOA	Cool @ 4°C, HCl preservative	7 days (unpreserved) to 14 days (preserved)
	PCBs	EPA 8082	1 L amber glass bottle	Cool @ 4°C	14 days
	Tributyltin	EPA 8270E-SIM	500 mL amber glass bottle	Cool @ 4°C	7 days

*Noted holding time refers to time from sampling to extraction, not analysis.

6.1.3 Chain of Custody

Sample collection, transport, and analysis will be completed under chain of custody protocols to provide an accurate written record of sample possession from collection through analysis. Samples will be entered into a chain of custody form, provided by the laboratory, at the end of each field day. The field personnel responsible for sample collection will complete the chain of custody, note the shipping company the cooler is being relinquished to, and place it within a plastic bag inside each cooler.

The laboratory receiving the samples will note the time and date of sample arrival and document samples in accordance with their respective standard operating procedures.

6.1.4 Sample Storage, Handling, and Shipping

After collection, all samples will be stored in an ice-filled cooler to maintain sample temperature at or below approximately 4°C. Samples will be packaged carefully to avoid breakage.

Prior to delivery to a shipping company, new ice or ice packs will be placed in the cooler to maintain the desired 4°C temperature. Sample coolers will be taped shut with the chain of



custody inside and delivered to the shipping company. Samples will be delivered to the shipping company within 48 hours of collection for delivery approximately 24 hours later. Samples will be delivered to the laboratory within the required holding times outlined in Table 4.

6.2 Data Quality Evaluation

The quality of data collected in this investigation will be evaluated for accuracy, precision, representativeness, completeness, and comparability.

Accuracy measures how close a measured value is to the true value in question. Accuracy is calculated as a percent recovery of a known value, which typically takes the form of a manufactured or laboratory-prepared standard. Alternatively, a known surrogate is used that can be spiked into a sample by the laboratory as part of the analysis procedure.

Precision is how closely a set of replicate measurements match one another. Evaluation of measurement precision takes into account variability in soil conditions, sampling activities, sample handling, preservation, storage, and/or analysis. Data precision is assessed using laboratory and field duplicates, which can independently assess analytical equipment precision and overall precision, respectively. Data precision is reported as a relative percent difference (RPD), or the difference of two measurements divided by the average of the two measurements.

Representativeness means that a population of measurements that accurately reflect the temporal and spatial variations of, in this case, contaminant concentrations. Representativeness is addressed qualitatively in the proposed RI work plan, with the described rationale for sampling locations and depths.

Comparability addresses whether data collected in the investigation can be compared with another data set. All data collected as part of the proposed work plan should be internally directly comparable. This is accomplished through the use of consistent field personnel and procedures, analytical laboratories, and data assessment techniques throughout the duration of the project. Additionally, data should be generally comparable to other data produced from other similar investigations using similar techniques and analytical procedures.

Completeness represents a measure of how much valid data is necessary to complete a project's objectives. Completeness is addressed qualitatively in the RI work plan, which has been designed to complete the remedial investigation of contamination at the Site, based on the information available at this time. As new information is gathered, an evaluation of data completeness should be carried out to determine whether the project's objectives have been met.

6.3 Sample Analysis QA/QC

The analytical methodologies to be used for soil and water sample analysis by the laboratory are provided in Tables 5 and 6, respectively. These tables include the measurement quality objectives (MQOs) for each analyte, including method detection limits (MDLs), reporting limits



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(RLs), and percent recovery and relative percent difference (RPD) acceptance criteria provided by F&B. F&B's standard reporting limit concentrations are below the selected screening levels proposed in this work plan.



Table 5. MQOs for Soil Samples - Analytical Methods and Detection Limits

Analyte	Analytical Method	MDL (mg/kg)	RL (mg/kg)	LCS (%)	RPD (%)
Oil	NWTPH-Dx	31.95	250	70-130	≤ 20
Diesel		5.39	50		
Gasoline	NWTPH-Gx	1.4	2	61-153	
Benzo(a)pyrene	EPA 8270E	0.00021	0.01	68-120	
Benzo(a)anthracene		0.00027	0.01	70-130	
Benzo(b)fluoranthene		0.00024	0.01	69-125	
Benzo(k)fluoranthene		0.00030	0.01	70-130	
Chrysene		0.00023	0.01	70-130	
Dibenz(a,h)anthracene		0.00029	0.01	67-128	
Indeno(1,2,3-cd)pyrene		0.00040	0.01	67-129	
Naphthalene		0.0052	0.01	28-125	
2-Methylnaphthalene		0.00045	0.01	10-192	
Acenaphthene		0.00032	0.01	36-125	
Acenaphthylene		0.00040	0.01	45-128	
Anthracene		0.00019	0.01	50-150	
Fluorene		0.00019	0.01	48-121	
Phenanthrene		0.00017	0.01	50-150	
Benzo[g,h,i]perylene		0.00037	0.01	33-131	
Fluoranthene		0.00018	0.01	50-150	
Pyrene		0.00031	0.01	40-134	
Arsenic	EPA 6020B	0.133	1	75-125	
Cadmium		0.031	1	75-125	
Chromium		0.276	1	75-125	
Lead		0.049	1	75-125	
Copper		0.160	5	75-125	
Zinc		0.834	5	75-125	
Mercury	EPA 1631E	0.0128	0.025	75-125	
Benzene	EPA 8260D or EPA 8021B	0.004	0.03	66-121	
Toluene		0.005	1	72-128	
Ethylbenzene		0.137	1	69-132	
Xylenes		0.323	3	69-131	
Dichlorodifluoromethane	EPA 8260D	0.105	0.5	10-142	
Chloromethane		0.065	0.5	10-126	
Vinyl chloride		0.017	0.05	10-138	
Bromomethane		0.301	0.5	10-163	
Chloroethane		0.074	0.5	10-176	
Trichlorofluoromethane		0.024	0.5	10-176	
Acetone		1.254	5	10-163	
1,1-Dichloroethene		0.019	0.05	10-160	
Hexane		0.126	0.25	10-137	
Methylene chloride		0.338	0.5	10-156	



Table 5. MQOs for Soil Samples - Analytical Methods and Detection Limits (continued)

Analyte	Analytical Method	MDL (mg/kg)	RL (mg/kg)	LCS (%)	RPD (%)
Methyl t-butyl ether (MTBE)	EPA 8260D	0.018	0.05	21-145	≤ 20
trans-1,2-Dichloroethene		0.010	0.05	14-137	
1,1-Dichloroethane		0.011	0.05	19-140	
2,2-Dichloropropane		0.015	0.05	10-158	
cis-1,2-Dichloroethene		0.011	0.05	25-135	
Chloroform		0.013	0.05	21-145	
2-Butanone (MEK)		0.647	1	19-147	
1,2-Dichloroethane (EDC)		0.014	0.05	12-160	
1,1,1-Trichloroethane		0.011	0.05	10-156	
1,1-Dichloropropene		0.011	0.05	17-140	
Carbon tetrachloride		0.005	0.05	9-164	
Benzene		0.009	0.03	29-129	
Trichloroethene		0.013	0.02	21-139	
1,2-Dichloropropane		0.008	0.05	30-135	
Bromodichloromethane		0.008	0.05	23-155	
Dibromomethane		0.013	0.05	23-145	
4-Methyl-2-pentanone		0.061	1	24-155	
cis-1,3-Dichloropropene		0.008	0.05	28-144	
Toluene		0.009	0.05	35-130	
trans-1,3-Dichloropropene		0.010	0.05	26-149	
1,1,2-Trichloroethane		0.005	0.05	10-205	
2-Hexanone		0.036	0.5	15-166	
1,3-Dichloropropane		0.009	0.05	31-137	
Tetrachloroethene		0.010	0.025	20-133	
Dibromochloromethane		0.014	0.05	28-150	
1,2-Dibromoethane (EDB)		0.00095	0.005	28-142	
Chlorobenzene		0.007	0.05	32-129	
Ethylbenzene		0.010	0.05	32-137	
1,1,1,2-Tetrachloroethane		0.007	0.05	31-143	
m,p-Xylene		0.019	0.1	34-136	
o-Xylene		0.011	0.05	33-134	
Styrene		0.010	0.05	35-137	
Isopropylbenzene		0.009	0.05	31-142	
Bromoform		0.015	0.05	21-156	
n-Propylbenzene		0.013	0.05	23-146	
Bromobenzene		0.012	0.05	34-130	



Table 5. MQOs for Soil Samples - Analytical Methods and Detection Limits (continued)

Analyte	Analytical Method	MDL (mg/kg)	RL (mg/kg)	LCS (%)	RPD (%)
1,3,5-Trimethylbenzene	EPA 8260D	0.011	0.05	18-149	≤ 20
1,1,2,2-Tetrachloroethane		0.011	0.05	28-140	
1,2,3-Trichloropropane		0.009	0.05	25-144	
2-Chlorotoluene		0.012	0.05	31-134	
4-Chlorotoluene		0.011	0.05	31-136	
tert-Butylbenzene		0.013	0.05	30-137	
1,2,4-Trimethylbenzene		0.010	0.05	10-182	
sec-Butylbenzene		0.010	0.05	23-145	
p-Isopropyltoluene		0.011	0.05	21-149	
1,3-Dichlorobenzene		0.012	0.05	30-131	
1,4-Dichlorobenzene		0.012	0.05	29-129	
1,2-Dichlorobenzene		0.012	0.05	31-132	
1,2-Dibromo-3-chloropropane		0.016	0.5	11-161	
1,2,4-Trichlorobenzene		0.013	0.25	22-142	
Hexachlorobutadiene		0.016	0.25	10-142	
Naphthalene		0.014	0.05	14-157	
1,2,3-Trichlorobenzene		0.012	0.25	20-144	
Aroclor 1016	EPA 8082A	0.013	0.02	55-137	
Aroclor 1254		0.011	0.02	51-150	
Aroclor 1260		0.011	0.02	51-150	
Tributyltin*	EPA 8270E-SIM	0.00045	0.0039	30-160	

Method detection limits (MDL) - values represent the highest MDL reported among the various instruments used at Friedman & Bruya Laboratory. Actual MDL may be lower depending upon the actual instrument used for sample analysis.

RL – standard reporting limit

LCS – laboratory control sample spike recovery acceptance criteria

RPD – relative percent difference between duplicate samples.

*Tributyltin MQOs are based upon values from Analytical Resources, LLC, the lab that will be responsible for this analysis.



Table 6. MQOs for Water Samples - Analytical Methods and Detection Limits

Analyte	Analytical Method	MDL (µg/L)	RL (µg/L)	LCS (%)	RPD (%)
Oil	NWTPH-Dx	56.55	250	70-130	≤ 20
Diesel		9.11	50		
Gasoline	NWTPH-Gx	46.9	100	69-134	
Benzo(a)pyrene	EPA 8270E	0.005	0.02	68-126	
Benzo(a)anthracene		0.009	0.02	70-130	
Benzo(b)fluoranthene		0.008	0.02	62-130	
Benzo(k)fluoranthene		0.009	0.02	67-125	
Chrysene		0.008	0.02	67-119	
Dibenz(a,h)anthracene		0.014	0.02	62-133	
Indeno(1,2,3-cd)pyrene		0.011	0.02	63-131	
Naphthalene		0.012	0.2	50-104	
2-Methylnaphthalene		0.009	0.2	54-109	
Acenaphthene		0.010	0.02	57-110	
Acenaphthylene		0.008	0.02	60-114	
Anthracene		0.008	0.02	65-117	
Fluorene		0.008	0.02	61-115	
Phenanthrene		0.013	0.02	63-113	
Benzo[g,h,i]perylene		0.010	0.04	57-133	
Fluoranthene		0.014	0.02	68-121	
Pyrene		0.013	0.02	66-125	
Arsenic	EPA 6020B	0.078	1	85-115	
Cadmium		0.058	1	85-115	
Chromium		0.276	1	85-115	
Lead		0.057	1	85-115	
Copper		0.165	5	85-115	
Zinc		0.241	5	85-115	
Mercury	EPA 1631E	0.000615	0.01	85-115	
Benzene	EPA 8260D or EPA 8021B	0.004	0.02	66-121	
Toluene		0.005	0.02	72-128	
Ethylbenzene		0.137	0.02	69-132	
Xylenes		0.323	0.06	69-131	
Dichlorodifluoromethane	EPA 8260D	0.244	1	46-206	
Chloromethane		0.367	10	70-142	
Vinyl chloride		0.137	0.02	70-130	
Bromomethane		3.692	5	56-197	
Chloroethane		0.368	1	70-130	
Trichlorofluoromethane		0.210	1	70-130	
Acetone		21.128	50	10-140	
1,1-Dichloroethene		1.685	1	70-130	
Hexane		0.156	5	54-136	
Methylene chloride		2.170	5	43-134	



Table 6. MQOs for Water Samples - Analytical Methods and Detection Limits (continued)

Analyte	Analytical Method	MDL (µg/L)	RL (µg/L)	LCS (%)	RPD (%)
Methyl t-butyl ether (MTBE)	EPA 8260D	0.176	1	70-130	≤ 20
trans-1,2-Dichloroethene		0.126	1	70-130	
1,1-Dichloroethane		0.087	1	70-130	
2,2-Dichloropropane		0.137	1	70-130	
cis-1,2-Dichloroethene		0.117	1	70-130	
Chloroform		0.083	1	70-130	
2-Butanone (MEK)		12.384	20	17-154	
1,2-Dichloroethane (EDC)		0.055	0.2	70-130	
1,1,1-Trichloroethane		0.078	1	70-130	
1,1-Dichloropropene		0.106	1	70-130	
Carbon tetrachloride		0.061	0.5	70-130	
Benzene		0.070	0.35	70-130	
Trichloroethene		0.095	0.5	70-130	
1,2-Dichloropropane		0.177	1	70-130	
Bromodichloromethane		0.063	0.5	70-130	
Dibromomethane		0.198	1	70-130	
4-Methyl-2-pentanone		0.538	10	68-130	
cis-1,3-Dichloropropene		0.058	0.4	69-131	
Toluene		0.044	1	70-130	
trans-1,3-Dichloropropene		0.063	0.4	70-130	
1,1,2-Trichloroethane		0.178	0.5	70-130	
2-Hexanone		0.381	10	45-138	
1,3-Dichloropropane		0.057	1	70-130	
Tetrachloroethene		0.098	1	70-130	
Dibromochloromethane		0.073	0.5	60-148	
1,2-Dibromoethane (EDB)		0.0066	0.01	70-130	
Chlorobenzene		0.051	1	70-130	
Ethylbenzene		0.062	1	70-130	
1,1,1,2-Tetrachloroethane		0.058	1	70-130	
m,p-Xylene		0.102	2	70-130	
o-Xylene		0.071	1	70-130	
Styrene		0.060	1	70-130	
Isopropylbenzene		0.046	1	70-130	
Bromoform		0.127	5	69-138	
n-Propylbenzene		0.055	1	70-130	
Bromobenzene		0.070	1	70-130	



Table 6. MQOs for Water Samples - Analytical Methods and Detection Limits (continued)

Analyte	Analytical Method	MDL (µg/L)	RL (µg/L)	LCS (%)	RPD (%)
1,3,5-Trimethylbenzene	EPA 8260D	0.049	1	70-130	≤ 20
1,1,2,2-Tetrachloroethane		0.097	0.2	70-130	
1,2,3-Trichloropropane		0.123	1	70-130	
2-Chlorotoluene		0.045	1	70-130	
4-Chlorotoluene		0.057	1	70-130	
tert-Butylbenzene		0.053	1	70-130	
1,2,4-Trimethylbenzene		0.076	1	70-130	
sec-Butylbenzene		0.069	1	70-130	
p-Isopropyltoluene		0.050	1	70-130	
1,3-Dichlorobenzene		0.055	1	70-130	
1,4-Dichlorobenzene		0.052	1	70-130	
1,2-Dichlorobenzene		0.063	1	70-130	
1,2-Dibromo-3-chloropropane		0.072	10	70-130	
1,2,4-Trichlorobenzene		0.096	1	70-130	
Hexachlorobutadiene		0.095	0.5	70-130	
Naphthalene		0.067	1	70-130	
1,2,3-Trichlorobenzene		0.057	1	70-130	
Aroclor 1016	EPA 8082A	0.010	0.01	25-111	
Aroclor 1254		0.009	0.01	23-123	
Aroclor 1260		0.009	0.01	23-123	
Tributyltin*	EPA 8270E-SIM	0.043	0.193	30-160	

Method detection limits (MDL) - values represent the highest MDL reported among the various instruments used at Friedman & Bruya Laboratory. Actual MDL may be lower depending upon the actual instrument used for sample analysis.

RL – standard reporting limit

LCS – laboratory control sample spike recovery acceptance criteria

RPD – relative percent difference between duplicate samples.

*Tributyltin MQOs are based upon values from Analytical Resources, LLC, the lab that will be responsible for this analysis.

Laboratories will be responsible for appropriate QA/QC procedures on their analytical equipment including regular instrument calibration and analysis of calibration blanks. The laboratory will also perform the following QA/QC procedures on samples analyzed for this investigation:

- Surrogate recovery
- Laboratory control blanks
- Method blanks



- Laboratory duplicates
- Matrix spikes and matrix spike duplicates

If the results of any of these procedures fall outside of the laboratory-prescribed limits, the results may be “j” flagged, indicating that the reported result is an estimate. Any additional flags attached to reported data in the laboratory will be assessed to determine whether the flag disrupts our ability to assess conditions of the site. Definitions of the data qualifier flags will be included in the laboratory reports.

If high levels of contamination are detected in the initial screening by the laboratory, samples may be diluted to keep the solution within the quantitation limits of the laboratory equipment. The final dilution amounts will be included in the laboratory report.

6.4 Data Verification & Validation

All data generated from sampling activities will be reviewed, verified, and validated in accordance with the EPA's *National Functional Guidelines for Organic Superfund Methods Review* (November 2020) and *National Functional Guidelines for Inorganic Superfund Methods Review* (November 2020).

As part of internal QA/QC procedures, Stratum Group personnel will review project data to verify that key project criteria were met including:

- Verify the correct samples were analyzed for the correct analytes, and data is reported in appropriate units.
- Verify acceptable sample preservation and holding times.
- Verify proper field instrument calibrations were performed.
- Verify that no analytes are present in blank samples and that one blank was included in each sample cooler delivery where VOCs are analyzed.
- Verify that at least 10% of soil samples and 10% of groundwater samples include a field duplicate that is analyzed.
- Verify that at least 10% of samples analyzed by each method include a field duplicate that is analyzed.
- Review the laboratory report narrative for potential problems or deficiencies in the data.
- Apply appropriate data qualifiers to the data, if needed.
- Verify that data abides by the established MQOs.

In addition to internal data verification, formal data validation will be completed by a third-party organization that specializes in data quality assessment (e.g., Ecochem or Laboratory Data Consultants). Per a request from the Ecology Site Manager, data for this investigation will undergo Tier 2B validation, which includes validation of both the laboratory analytical data (2A) and the laboratory instrument-related quality control data (2B), as described in the Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use (EPA, 2009)



Upon successful verification and validation of sampling data, an assessment of the usability of the data will be conducted. Stratum Group project managers will evaluate the content and spatial distribution of sample results to determine whether the data collected is sufficient to achieve the project objectives or whether additional data needs to be collected. A discussion of the QA/QC assessment will be presented in the RI report completed for the investigation activities outlined in the RI work plan.

6.5 Corrective Action

Corrective actions are procedures that may be implemented in the event that samples do not meet the QA/QC objectives outlined in this QAPP. Corrective actions will depend upon the problem(s) encountered and will generally have to be defined if and when problems are identified. Corrective actions may be identified and implemented by project managers from Stratum Group and/or the laboratory and will be documented in a QA/QC section of the final report for this investigation.



7.0 REFERENCES

Environmental Protection Agency (EPA), 2002. Guidance for Quality Assurance Project Plans, QA/R-5. EPA Publication 240/R-02/009. December 2002.

EPA, 2009. Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use. January 2009.

EPA, 2020a. National Functional Guidelines for Organic Superfund Methods Review. November 2020.

EPA, 2020b. National Functional Guidelines for Inorganic Superfund Methods Review. November 2020.

Stratum Group, 2024. Remedial Investigation Work Plan: Lovric's Sea Craft. Stratum Group Project 6.1.21. November 19, 2024.

Washington Department of Ecology (Ecology), 2016. Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies. Ecology Publication 04-03-030. July 2004. Revised December 2016.





FIELD BORING LOG Boring _____

PROJECT NUMBER	DRILLING COMPANY	COORDINATES
PROJECT NAME	DRILLER	COORD SYS
CLIENT	DRILL RIG	SURFACE ELEVATION
ADDRESS	DRILLING METHOD	WELL TOC
DRILLING DATE	TOTAL DEPTH	LOGGED BY
	DIAMETER	

COMPLETION	CASING	WELL SCREEN
COMMENTS (e.g., boring location)		

Depth (m)	PID	Samples	Water	Material Description (e.g., color, composition, moisture, grain size, roundedness, density - Inferred geologic contact)	Additional Observations (e.g., environmental indicators, well screen depth, etc.)
0.5					
1					
1.5					
2					
2.5					
3					
3.5					
4					
4.5					
5					
5.5					
6					
6.5					
7					
7.5					
8					
8.5					
9					
9.5					
10					



FIELD BORING LOG Boring _____

Depth (m)	PID	Samples	Water	Material Description (e.g., color, composition, moisture, grain size, roundedness, density - Inferred geologic contact)	Additional Observations (e.g., environmental indicators, well screen depth, etc.)
10.5					
11					
11.5					
12					
12.5					
13					
13.5					
14					
14.5					
15					
15.5					
16					
16.5					
17					
17.5					
18					
18.5					
19					
19.5					
20					
20.5					
21					
21.5					
22					



FIELD BORING LOG Boring _____

Depth (m)	PID	Samples	Water	Material Description (e.g., color, composition, moisture, grain size, roundedness, density - Inferred geologic contact)	Additional Observations (e.g., environmental indicators, well screen depth, etc.)
22.5					
23					
23.5					
24					
24.5					
25					
25.5					
26					
26.5					
27					
27.5					
28					
28.5					
29					
29.5					
30					
30.5					
31					
31.5					
32					
32.5					
33					
33.5					
34					
34.5					