**REVISED**
**FEASIBILITY STUDY AND REMEDIAL ACTION PLAN**

**HYDE STREET STUDY AREA**
**2950 HYDE STREET**
**SAN FRANCISCO, CALIFORNIA**

**Submitted by:**
**Farallon Consulting, L.L.C.**
**330 Franklin Street, Suite 200**
**Oakland, California 94607**

**Farallon PN: 2609-001**

**For:**
**Pilot Thomas Logistics LLC**
**(formerly Maxum Petroleum, Inc.)**
**Hyde Street Harbor Facility**
**442 Jefferson Street**
**San Francisco, California**

September 14, 2023

Prepared by:

Martin Hamann, P.G.
Principal Hydrogeologist

CERTIFIED HYDROGEOLOGIST
MARTIN E. HAMANN
No. 203
STATE OF CALIFORNIA

Reviewed by:

Divya Bhargava, P.E.
Senior Engineer

LICENSED PROFESSIONAL ENGINEER
DIVYA BHARGAVA
C 82024
CIVIL
STATE OF CALIFORNIA

James Schwartz, P.G.
Principal Geologist

PROFESSIONAL GEOLOGIST
JAMES P. SCHWARTZ
No. 7485
STATE OF CALIFORNIA

# TABLE OF CONTENTS

## FIGURES



## TABLES



## APPENDIX

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ARARs | applicable or relevant and appropriate requirements |
| ASTs | aboveground storage tanks |
| BCDC | San Francisco Bay Conservation and Development Commission |
| bgs | below ground surface |
| CDFW-OSPR | California Department of Fish and Wildlife – Office of Spill Prevention and Response |
| CEQA | California Environmental Quality Act |
| COCs | chemicals of concern |
| CSM | conceptual site model |
| EPA | U.S. Environmental Protection Agency |
| EPA Order to Maxum | Docket No. CWA 311-09-2021-002, Order for Removal, Mitigation or Prevention of a Substantial Threat of Oil Discharge, issued by the U.S. Environmental Protection Agency to Maxum on March 1, 2021 |
| EPA Order to Port | EPA Docket No. CWA-311-09-2020-0003 issued by the U.S. Environmental Protection Agency to the Port of San Francisco on September 14, 2020 |
| ERM | ERM-West |
| ESLs | Environmental Screening Levels |
| ExxonMobil | ExxonMobil Oil Corporation |
| Farallon | Farallon Consulting, L.L.C. |
| FS/RAP | Feasibility Study/Remedial Action Plan |
| GP Resources | General Petroleum Resources |
| GRAs | general response actions |
| ISCO | In-Situ Chemical Oxidation |

| | |
|---|---|
| ISTD | In-Situ Thermal Desorption |
| LNAPL | light nonaqueous-phase liquid |
| lt-RAOs | longer-term remedial action objectives |
| Maxum | Maxum Petroleum, Inc. |
| MCLs | maximum contaminant levels |
| MNA | monitored natural attenuation |
| NAPL | nonaqueous-phase liquid |
| NCP | National Oil and Hazardous Substance Pollution Contingency Plan |
| NPDES | National Pollutant Discharge Elimination System |
| O&M | operation and maintenance |
| Pilot Thomas | Pilot Thomas Logistics, LLC |
| Port | Port of San Francisco |
| R99 diesel | R99 Renewable Diesel |
| RAAs | remedial action alternatives |
| RAOs | remedial action objectives |
| Resolution 92-49 | California State Water Resources Control Board Resolution 92-49 |
| Site Investigation Report | *Site Investigation Report, Hyde Street Study Area, 2950 Hyde Street, San Francisco, California* dated February 8, 2022 prepared by Farallon Consulting, L.L.C. for Pilot Thomas Logistics, LLC |
| Site | Hyde Street Harbor Petroleum Seep in San Francisco, California |
| st-RAOs | short-term remedial action objectives |
| TPH | total petroleum hydrocarbons |
| TPHd | total petroleum hydrocarbons as diesel |
| TPHg | total petroleum hydrocarbons as gasoline |

| | |
|---|---|
| TPHmo | total petroleum hydrocarbons as motor oil |
| USCG | U.S. Coast Guard |
| UST | underground storage tank |
| VOCs | volatile organic compounds |
| Water Board | San Francisco Bay Regional Water Quality Control Board |

# 1.0 INTRODUCTION

Farallon Consulting, L.L.C. (Farallon) has prepared this Feasibility Study/Remedial Action Plan (FS/RAP) for Pilot Thomas Logistics, LLC (Pilot Thomas), formerly Maxum Petroleum, Inc. (Maxum), to document investigations performed, and to describe the proposed remedial action to address soil and groundwater issues identified at the Hyde Street Harbor Petroleum Seep in San Francisco, California (herein referred to as the Site) (Figure 1). This FS/RAP has been prepared in response to the Requirement for a Remedial Action Plan issued by the San Francisco Bay Regional Water Quality Control Board (Water Board) to Maxum and the Port of San Francisco (Port) on July 13, 2021. Maxum operated a marine fueling facility in Hyde Street Harbor on a dock that dispensed R99 Renewable Diesel (R99 diesel). The Site and the marine fueling facility are owned by the Port.

## 1.1 PURPOSE

The purpose of the FS/RAP is to provide information regarding the methods used to plan the proposed remedial actions and the method of implementation. The objectives for the FS/RAP are to obtain concurrence from stakeholders on the technical basis and approach for performing the remedial action, and to address chemicals of concern (COCs) associated with the release of R99 diesel identified during investigations previously conducted at and around the Site, to protect and maintain groundwater Designated Beneficial Uses, and to prevent, minimize, or eliminate potentially unreasonable risks to public health and/or the environment associated with the COCs.

This FS/RAP evaluated Site data and identified cleanup objectives that are protective of public health and the environment, including water quality, in accordance with California State Water Resources Control Board Resolution 92-49 (Resolution 92-49). This FS/RAP includes an evaluation of remedial alternatives and presents the selected final remedy for all COCs related to R99 diesel releases from the Site, consistent with Resolution 92-49 and the National Oil and Hazardous Substance Pollution Contingency Plan (NCP).

## 1.2 DOCUMENT ORGANIZATION

This FS/RAP has been organized into the following sections:

- **Section 2**, **Site Description**, presents a description of the Site and Site vicinity, the discovery of release, and regulatory oversight and orders; summarizes the Site operational history and Pilot Thomas involvement; and provides a description of R99 diesel and the environmental setting.
- **Section 3**, **Prior Investigations and Remedial Actions**, presents the techniques employed during and results from environmental condition assessments previously conducted at the Site.

- **Section 4, Conceptual Site Model and Risk Hazard Assessment,** evaluates the COCs, potential release mechanisms, migration pathways, the extent of R99 diesel, and sensitive receptors. Identified data gaps also are discussed.
- **Section 5, Remedial Action Objectives and Cleanup Goals,** describes the short- and long-term remedial action objectives (RAOs), the applicable or relevant and appropriate requirements (ARARs), regulatory requirements, and the proposed cleanup goals.
- **Section 6, Remedial Technology Screening and Evaluation,** discusses NCP criteria, general response actions, and the identification and screening of remedial technologies.
- **Section 7, Preferred Remedial Action Alternative,** presents the selected remedial alternative in light of the RAOs and NCP criteria, and provides budgetary cost estimates.
- **Section 8, Remedial Action Plan,** describes the elements of the remedial action plan selected to address the remedial action objectives for the Site R99 diesel.
- **Section 9, Schedule,** presents the proposed schedule to perform fieldwork and submit deliverables for implementation of this FS/RAP.
- **Section 10, Bibliography,** provides a list of source materials used in preparing this FS/RAP.

# 2.0 SITE DESCRIPTION

This section presents a description of the Site and Site vicinity, the discovery of release, and regulatory oversight and orders; summarizes the Site operational history and Pilot Thomas involvement; and provides a description of R99 diesel and the environmental setting. More-detailed descriptions of the Site history, subsurface conditions, and prior field activities were provided in the documents listed in Section 10, Bibliography.

## 2.1 SITE DESCRIPTION

The Site was described as "the discharge of oil into Hyde Street Harbor, approximately 250 feet northeast of the intersection of Hyde Street and Jefferson Street, San Francisco, California."[1] The Site is generally within portions of San Francisco City and County Assessor Parcel Nos. 0007001, 0002001, and 9900250. The Site is bounded to the north by Hyde Street Harbor, to the east by Leavenworth Street, to the south by Jefferson Street, and to the west by Hyde Street (Figures 1 and 2).

The marine fueling facility at 442 Jefferson Street in San Francisco, California, leased and operated by Pilot Thomas, is within the boundaries of the Site (Figures 1 and 2). The Site and the marine fueling facility are owned by the Port. The marine fueling facility is bounded by the San Francisco Bay to the north; the Alioto Lazio Fish Co. to the east; Jefferson Street to the south; and SF Silver Fox Sport Fishing and Tours and the 482 Jefferson Street Parking Lot to the west. An asphalt driveway and a pedestrian walkway connected to Jefferson Street are present parallel to and east of Hyde Street, connecting the 482 Jefferson Street Parking Lot to a parking lot adjacent to a fuel dock. The marine fueling facility and nearby properties are zoned C-2 District: Community Business.

The marine fueling facility includes a fuel dispenser on a floating dock, and a fuel storage area with two double-walled 20,000-gallon aboveground storage tanks (ASTs). The ASTs are connected to 4-inch-diameter steel fuel-supply pipes within fiberglass secondary containment. The product-supply pipeline extends underground from the ASTs, emerges above ground beneath the pile-supported dock, and then connects to the fuel dispenser on the floating dock. The remote filling pipeline extends underground from a fill port to the ASTs, as shown on Figure 2. The pipes are approximately 3 to 4 feet below ground surface (bgs), with the exception of the aboveground pipeline segment beneath the dock. Trench plates cover four small excavations that expose the buried piping. A truck-fill connection shed in a parking lot west of the fuel storage area was used to offload fuel from trucks for transfer into the ASTs.

---

[1] Docket No. CWA 311-09-2021-002, *Order for Removal, Mitigation or Prevention of a Substantial Threat of Oil Discharge*, issued by the U.S. Environmental Protection Agency (EPA) to Maxum on March 1, 2021 (EPA Order to Maxum).

The double-walled ASTs are on a concrete surface within secondary containment that has a storage capacity of 22,000 gallons. A 2.7-foot-high concrete containment wall that surrounds the ASTs serves as tertiary containment for the ASTs, and as secondary containment for aboveground piping present in the fuel storage area. A concrete-lined sump within this containment area collects stormwater that falls in the fuel storage area.

## 2.2 DISCOVERY OF RELEASE

According to the EPA Order to Maxum, on August 6, 2020, the U.S. Coast Guard (USCG) received incident notification USCG Incident Number #20-165 from the Port of multiple sheens on surface water in Hyde Street Harbor, which is connected to San Francisco Bay and the Pacific Ocean. The incident notification noted that oil appeared to be intermittently entering Hyde Street Harbor from the shoreline at the Site. The EPA Order to Maxum stated that the presence of oil from the discharge was a substantial threat of continued release of oil into or on navigable waters or adjoining shorelines to navigable waters.

CDIM Engineering (CDIM) (2021b), a consultant to the Port, collected soil samples from 11 locations. Evidence of "red-dye diesel" was observed in the two borings located proximate to the Port's underground 4-inch-diameter diesel-supply pipeline connecting the marine fuel terminal to the two 20,000-gallon ASTs. EPA concluded that red-dye diesel likely was released from the Port's pipeline connecting the marine fuel dock to the ASTs.

## 2.3 REGULATORY OVERSIGHT AND ORDERS

This section discusses the regulatory oversight of the R99 diesel release.

### 2.3.1 U.S. Environmental Protection Agency

EPA issued EPA Docket No. CWA-311-09-2020-0003 to the Port on September 14, 2020 (EPA Order to Port), directing the Port to take all necessary steps to identify sources of the Site discharge, and to remove the Site discharge or threat of discharge of oil into Hyde Street Harbor, including removal of soil contaminated with petroleum hydrocarbons. EPA directed the Port to submit a Work Plan for EPA review and approval to implement these requirements.

The Work Plan (CDIM 2020a) was submitted by the Port to EPA on September 21, 2020, and was approved by EPA on October 2, 2020. Pursuant to the Work Plan, the Port began investigating the Site through its contractor, CDIM, in October 2020. The results from the CDIM investigation were summarized in the CDIM (2021b) Data Summary Report.

EPA issued its Order to Maxum on March 1, 2021, which required the following work to be performed:

- Ensuring that oil from the Site did not enter navigable waters, tributaries, or adjacent shorelines.
- Taking all necessary steps to identify sources of the Site discharge and to remove the Site discharge or threat of discharge of oil into Hyde Street Harbor or adjacent shorelines, including removal of soil contaminated with petroleum hydrocarbons.
- Submitting a Work Plan to perform the work required by the EPA Order to Maxum, which was to include:
    - The study, design, and implementation of immediate measures to halt the discharge of oil into the environment.
    - The study, design, and implementation of measures to identify, clean up, and remove all oil and petroleum contamination at the Site and all impacted areas, including removal of soil contaminated with petroleum hydrocarbons.
    - A sampling plan, quality assurance/quality control, data validation, and schedules for implementing and completing all tasks described in the Work Plan.

### 2.3.2 San Francisco Bay Regional Water Quality Control Board

Although EPA was the primary lead for environmental oversight in the early stages of the Site investigation, the Water Board was included, copied on correspondence and reports, and contributed to and complemented the EPA lead role. On July 27, 2022, EPA (2022) determined that no additional work would be required from Maxum and Pilot Thomas under the EPA Order to Maxum and the amended Order that added Pilot Thomas as a Respondent, and terminated the Orders and its involvement in oversight. EPA noted that the Water Board retained jurisdiction to oversee ongoing remediation at Hyde Street Harbor.

The Water Board subsequently has taken the lead for regulatory oversight, requiring interim remedial activities, reports, and preparation of this FS/RAP.

## 2.4 SITE OPERATIONS

Fueling operations are inactive. When in operation, fueling operations were conducted by two full-time employees Monday through Friday from 6:00 a.m. to 5:00 p.m., and Saturday from 8:00 a.m. to 4:00 p.m. Fuel delivery trucks entered the facility via Jefferson Street, connected to the truck fill port, and transferred R99 diesel to the two ASTs in the fuel storage area via the remote filling pipeline. Fuel was pumped from the two ASTs to the fuel dock via the product supply pipeline.

The pipelines connecting the ASTs to the fill port and the floating dock have been taken out of service and are closed. Residual R99 diesel is stored in the ASTs pending removal by Pilot Thomas.

## 2.5 SITE VICINITY

The Site is in the vicinity of San Francisco's Fisherman's Wharf, in an area zoned for commercial and industrial use. Hyde Street Harbor and San Francisco Bay are north of the Site; commercial fish businesses and restaurants are to the east; restaurants and other commercial buildings, including a hotel, are to the south; and the San Francisco Maritime National Historical Park is to the west (Figure 2).

## 2.6 OPERATIONAL HISTORY

The Site was part of San Francisco Bay until the area was filled with earthquake debris and fill material from local excavations after 1906, and reclaimed by the State of California. In 1969, land ownership was transferred from the State of California to the Port, which has maintained ownership to the present (Acton Mickelson Environmental, Inc. 2009).

Fuel-related operations up- and cross-gradient and in the vicinity of the Site are conducted by ARCO, ChevronTexaco, Del Monte Foods, Inc., Shell Oil, and Unocal.

General Petroleum and Mobil Oil, a predecessor to current ExxonMobil Oil Corporation (ExxonMobil) operated on and near the Site from the time of its development circa 1935 until 1990, when General Petroleum Resources (GP Resources), a predecessor in interest to Pilot Thomas, not affiliated with General Petroleum, Mobil Oil, or ExxonMobil) assumed operation of the marine fuel terminal. In 1992, the Port leased the facility to GP Resources, who continued to operate as a marine fuel terminal until operations were discontinued in April 2021.

ExxonMobil's operations included a 150,000-gallon diesel fuel AST and a 20,000-gallon diesel fuel AST, both removed in the early 1990s, and a 1,000-gallon gasoline underground storage tank (UST), removed in 1986. A release from the gasoline UST was reported at the time of its removal in 1986, and a diesel fuel release estimated at 336 to 692 gallons was reported in 1990.

Order No. R2-2006-0020 was issued to ExxonMobil and the Port, and remedial actions were conducted at the Site under the direction of the Water Board. The Final Environmental Risk Assessment was approved by the Water Board in 2014, and no further remedial actions were required. Risk Management protocols for contamination left in soil and groundwater stated, "residual petroleum hydrocarbons in the subsurface… may be present as residual NAPL [nonaqueous-phase liquid], sorbed phase, and/or dissolved phase," in both soil and groundwater (Acton Mickelson Environmental, Inc. 2015). Residual contamination also includes polycyclic aromatic hydrocarbons, metals, and methyl tertiary-butyl ether.

Remedial actions have included:

- UST removal in 1986;
- Quarterly groundwater monitoring beginning in 1991;
- Removal of light nonaqueous-phase liquid (LNAPL) from wells from 1992 to 2000;

- Installation of a recovery trench and additional wells in 1995;
- Operation of a vapor extraction/automatic LNAPL recovery system in 1996;
- LNAPL recovery with absorbent socks from 2000 to 2008;
- In-situ chemical oxidation from 2006 to 2008;
- Removal of abandoned pipelines and grouting of stormwater outfalls in 2008;
- Excavation of 1,238.93 tons of contaminated soil, and installation of a shoreline permeable reactive barrier during 2010 and 2011;
- Seep and sheen monitoring during 2011 and 2012; and
- High-intensity vacuum extraction from selected wells during 2012 and 2013.

A release of approximately 200 to 500 gallons of diesel fuel resulting from GP Resources operations (unrelated to ExxonMobil activities) occurred on August 1, 2011 (Acton Mickelson Environmental, Inc. 2012). Spilled diesel fuel was predominantly in the AST secondary containment area, and was reported not to have entered any waterways.

### 2.6.1 Port of San Francisco Involvement

The Port reported observation of hydrocarbon sheens in Hyde Street Harbor on April 17, 2020 in incident report NRC #127-5586 submitted to the National Response Center. On July 9, 2020, Port staff observed an area of suspected hydrocarbon discharge from the shoreline at the base of the pier along the western edge of Hyde Street Harbor. On September 4, 2020, Port staff observed an area of suspected hydrocarbon discharge under the pier at the northern end of Leavenworth Street and at the western end of Wharf J-9.

The Port, with USCG, EPA, the California Department of Fish and Wildlife – Office of Spill Prevention and Response (CDFW-OSPR), the Water Board, and the San Francisco Bay Conservation and Development Commission (BCDC) established that the observed sheens appeared to be the result of a source located under former Wharf J-10 and the western portion of Wharf J-9 (CDIM 2021b).

USCG issued a Notice of Federal Interest to the Port, ExxonMobil, Marathon Oil, Shell Oil, ChevronTexaco, and Pacific Gas & Electric Company. EPA issued a Notice of Federal Interest to the Port and ExxonMobil. EPA issued the Order to the Port on September 14, 2020.

The Port submitted a Work Plan to EPA on September 21, 2020 in response to the EPA Order to the Port (CDIM Engineering 2020a). The Port reported received written approval of the Work Plan from the Water Board on September 28, 2020; verbal approval of the Work Plan from USCG and CDFW-OSPR during an Interagency Incident Management Team meeting on October 1, 2020; written approval from EPA on October 2, 2020; and verbal approval from BCDC during an Interagency Incident Management Team meeting on October 8, 2020.

The Port submitted a Sampling and Analysis Plan to EPA on December 11, 2020 to describe sample locations, procedures, and laboratory analysis to investigate for sources of discharges from the Site (CDIM 2020b). EPA approved the Sampling and Analysis Plan on or around December 18, 2020. The work defined in the Sampling and Analysis Plan was completed in February 2021 (CDIM 2021b).

The Port deployed and maintained floating booms off-shore of the Site; removed floating product within the boom using absorbent pads and an oil skimmer; performed seep monitoring activities; collected seep product samples for laboratory analysis; developed a waste management strategy; engaged contractors and consultants for operational and technical professional services support; developed a communications strategy, statements, and presentations; notified regulatory agencies; contacted potentially responsible parties; and performed investigations.

### 2.6.2 Summary of Port Investigations

CDIM conducted Site investigations on behalf of the Port prior to the EPA Order to Maxum. Investigations conducted for the Port included monitoring of observable seeps; analysis of seep product samples; optical image profiling/hydraulic profiling tool borings; a geophysical survey; soil, groundwater, and LNAPL sampling; and direct-push technology borings.

The results from the investigations determined:

- Oil seepage was most evident at the southwestern corner of the Outer Lagoon during mid- to low tides. LNAPL was observed directly south of the oil seep at depths of between 5 and 13 feet bgs.
- The oil seep product and the LNAPL observed in shoreline soil was predominantly red-dyed R99 diesel.
- Petroleum hydrocarbons were detected in soil and groundwater samples. Forensic chemical analytical results for soil and groundwater samples showed the presence of R99 diesel and a mixed assemblage of weathered petrogenic and pyrogenic contaminants.
- Concentrations of total petroleum hydrocarbons (TPH) detected in unfiltered grab groundwater samples in the vicinity of the Site were higher than those detected in monitoring wells installed, tested, and closed by ExxonMobil during soil, sediment, and groundwater remediation activities conducted at the Site between 1996 and 2013, suggesting the potential for groundwater impacts from dissolved TPH in an area extending beyond observed NAPL.

## 2.7 PILOT THOMAS INVOLVEMENT

Pilot Thomas, assumed operation of the marine fuel terminal in 1990, and entered into a lease with the Port in 1992. According to records provided by Pilot Thomas, use of R99 diesel in the tanks and pipelines reportedly commenced in approximately 2018, and composed a portion of the total fuel dispensed by Pilot Thomas. By 2019, R99 diesel composed approximately 98.6 percent of the fuel dispensed; by 2021, fuel dispensed was solely R99 diesel.

The Port's consultant, CDIM, concluded that the fuel release likely was R99 diesel associated with the marine fueling operation. EPA subsequently issued its Order to Maxum; in response, Pilot Thomas has been working cooperatively with EPA, the Water Board, and the Port to delineate the nature and extent of R99 diesel as LNAPL, to evaluate and select a remedial response.

## 2.8 R99 DIESEL

R99 diesel (also referred to as renewable diesel) refers to petrodiesel-like fuels derived from biological sources that chemically are not esters, and therefore are distinct from biodiesel. Although chemically similar to petrodiesel, R99 diesel is made of recently living biomass. The term "renewable diesel" means fuel derived from biomass using a thermal depolymerization process. In its pure form, renewable diesel is designated R100; a blend composed of 20 percent renewable diesel and 80 percent petrodiesel is called R20. Because renewable diesel is chemically similar to petrodiesel, it can be mixed with petrodiesel in any proportion.

Renewable diesel can be made from a host of items, usually low-value waste products. The most-common feedstock currently used are waste vegetable oil, wastes from animal rendering, and other biologically derived oils. Processes using bio-oils follow a hydrogenation process to turn low-value waste oils into higher-value diesel fuel. "R99" stands for 99 percent renewable diesel and 1 percent petroleum diesel.

R99 diesel elutes as TPH as diesel (TPHd) at $C_{10}$-$C_{25}$, and a portion elutes as TPH as motor oil (TPHmo) at $C_{25}$-$C_{36}$ by EPA Method 8015B. As part of this investigation, Farallon worked with a forensic chemist at Apex Forensics to evaluate the forensic results for R99 diesel at the Site. A sample of R99 diesel was analyzed by ASTM International Method D2887-14 to determine the boiling and chemical composition of the fuel. The fuel sample was analyzed also by EPA Method 8015B, EPA Method 8270E Modified, and ASTM International Methods 5453 and ASTM D6730-11 to differentiate constituents in the fuel. The water-soluble fraction of the fuel was analyzed by EPA Method 8260D for volatile organic compounds (VOCs). Results from these analyses are discussed in Section 4, Conceptual Site Model and Risk Hazard Assessment.

## 2.9 ENVIRONMENTAL SETTING

### 2.9.1 Surface Water

The Site and San Francisco Bay to the north are within the surface water of the San Francisco Bay Central Basin. Surface waters have received R99 diesel. The surface water north of the Site is equipped with booms to capture released R99 diesel and prevent it from migrating into San Francisco Bay.

### 2.9.2 Geology and Soil

The Site is in the San Francisco Sand Dune Area Basin, a part of the San Francisco Bay Basin. Heterogeneous fill material consisting of a mix of clays, silts, sands, gravels, debris, and boulders underlies the Site to a depth of approximately 17 feet bgs. Loose sands and silty clay are present beneath the fill. Underlying the loose sands and silty clay are undifferentiated Quaternary sediments known as the Bay Mud, consisting of interbedded sands, clays, and sandy clays. The thickness of the Bay Mud is approximately 125 feet regionally. The Franciscan basement formation underlies the Bay Mud (Acton Mickelson Environmental, Inc. 2009).

Subsurface soil observed in borings completed at the Site by CDIM (2021a) consist of a mix of natural backfill from local excavation, and assorted urban waste and debris from building demolition associated with the 1906 earthquake. Soils encountered in the borings consisted generally of yellow-brown and dark gray sandy, sometimes gravelly, silts, which were sometimes interbedded with layers of well-sorted sand. Intermittent layers of debris material such as wood chips, glass shards, bricks, and metal fragments were observed. The sediments observed during soil logging were consistent with artificial fill commonly found along the San Francisco waterfront. A more-detailed summary of subsurface soil conditions at the Site is provided in Section 4.4.1, Extent of R99 Diesel in Soil.

### 2.9.3 Hydrogeology

Groundwater is tidally influenced; the depth to groundwater ranges from approximately 4 to 10 feet bgs. Groundwater flow direction is predominantly north toward Hyde Street Harbor, although tidal fluctuations may change groundwater flow direction. Groundwater is not a source of drinking water, and is not likely to become a drinking water source in the foreseeable future.

As part of an LNAPL recovery pilot study, documented in the Pilot Study Summary Technical Memorandum (Farallon 2022b), the depth to groundwater at 13 groundwater monitoring wells was monitored on a daily or more-frequent basis to evaluate the effect of tidal fluctuations on depth to groundwater. The depth to groundwater was found to be directly affected by tidal fluctuations, and to show a close correlation between time and change in depth to groundwater and the distance from open water. The tidal study was summarized in the Site Investigation Report.[2]

[2] *Site Investigation Report, Hyde Street Study Area, 2950 Hyde Street, San Francisco, California* dated February 8, 2022 prepared by Farallon for Pilot Thomas (Farallon 2022a).

# 3.0 PRIOR INVESTIGATIONS AND REMEDIAL ACTIONS

This section describes investigations and interim remedial actions conducted by ERM-West (ERM) and Farallon for Pilot Thomas in response to the EPA Order to Maxum. The work was conducted to delineate the extent of LNAPL, and to inform the design for implementation of LNAPL-recovery remediation. Mobilization included health and safety awareness training and site orientation for field personnel, and establishment of material- and equipment-staging areas and work-control areas (a support zone, a contamination-reduction zone, and an exclusion zone). All work was conducted in accordance with the March 2021 Work Plan (ERM 2021) and Work Plan Addenda (Farallon 2021a, 2021b), as approved by EPA.

Field investigation was consistent with the EPA (2001) Triad Approach. Specific boring and well locations and information gathered in the field were reviewed and discussed by the Pilot Thomas and EPA Technical Team for approval in the field.

## 3.1 ABOVEGROUND STORAGE TANK AND PIPE TESTING

CGRS, Inc. of Sacramento, California, conducted pressure testing of the two ASTs, product supply line, and remote fill line on April 4, 2021. The testing documented failure in the subsurface AST product supply and remote fill lines (CGRS, Inc. 2021). Pilot Thomas ceased fuel-dispensing, and drained product supply and remote fill lines to prevent subsequent release of product. Copies of the reports documenting the pressure tests were provided in the Site Investigation Report.

## 3.2 PIPELINE EXPLORATORY POTHOLE EXCAVATIONS

ERM excavated potholes adjacent to the remote fill pipeline approximately every 30 lineal feet to expose the subsurface pipeline. Potholes were excavated using an air knife and/or Hydrovac technologies. The potholes exposed portions of the pipeline in the area between the ASTs and the remote fill location. No breaks or cracks in the pipeline were observed in the potholes. A specific release point of fuel from the pipeline could not be established.

## 3.3 SAMPLE COLLECTION

Samples collected at the Site and submitted for laboratory analysis consisted of R99 diesel from the ASTs, and samples of sediment, porewater, LNAPL floating on surface water and on groundwater, surface water, soil, and groundwater (Farallon 2022a), summarized below:

- A sample of fuel (identified as PS-1) collected from the ASTs;
- Samples of sediment collected along the base of the shoreline riprap wall;
- Samples of porewater, LNAPL on surface water, surface water, and water from seeps collected from inside the boom;
- Samples from soil collected from borings during installation of groundwater monitoring wells; and

- Samples of groundwater and LNAPL collected from groundwater monitoring wells.

Results from the sampling were provided in the Site Investigation Report, summarized below:

- Results from the testing of the two ASTs, the product supply line, and the remote fill line documented failure in the subsurface AST product supply and remote fill pipelines;
- R99 diesel and the R99 diesel water-soluble fraction are indicative of R99 diesel (biodiesel blend) of normal alkanes;
- TPHd and TPHmo were detected in sediment samples at concentrations that decreased eastward away from the dock and the central portion of the Site;
- TPHd and TPHmo concentrations in porewater north and slightly east of the central subsurface LNAPL release likely indicate migration of dissolved contaminants away from the source area;
- TPHd concentrations in surface water and in LNAPL floating on surface water consisted of a combination of R99 diesel and other petroleum hydrocarbons;
- R99 diesel was detected in 80 of the 132 soil samples collected, which correlated to locations near the R99 diesel LNAPL plume; and
- LNAPL samples collected from groundwater monitoring wells consisted predominantly of R99 diesel, with indication of non-R99 diesel in some samples.

## 3.4 BAIL-DOWN TESTS

In April and July 2021, bail-down tests were conducted in monitoring wells RS-01 through RS-05, RS-14, RS-15, RS-18, and RS-19 (wells with an LNAPL thickness of 0.2 foot or greater), to evaluate the recharge rate of LNAPL after removal. LNAPL thicknesses measured before and after LNAPL removal, and rates of LNAPL recharge estimated for each of the monitoring wells were used to select the monitoring wells to be used for the LNAPL recovery pilot study conducted in November and December 2021.

Bail-down test records were provided in the Site Investigation Report.

## 3.5 TIDAL STUDY

Farallon conducted a tidal study in July 2021. The duration of the tidal study presented in the EPA-approved Updated Work Plan Addendum (Farallon 2021a) was 5 days. However, additional tidal data were collected during the LNAPL recovery pilot study conducted in November and December 2021, which provided 5 additional weeks of tidal information (Farallon 2022b).

Tides have a significant effect on measured depth to groundwater and apparent LNAPL thickness in monitoring wells. During periods of high tide, the depth to groundwater in monitoring wells exhibited a corresponding decrease in depth to groundwater and a decrease in apparent LNAPL thicknesses. During periods of low tide, apparent LNAPL thicknesses generally increased.

Farallon (2022b) presented its evaluation of the time lag between the peak high or low tide in Hyde Street Harbor and the corresponding peak high or low depth to groundwater response in the monitoring wells. A pronounced time lag between the peak tide in the harbor and the corresponding response in the groundwater monitoring wells was observed.

The estimated average time lag for tidal effects in Hyde Street Harbor on groundwater elevations in the monitoring wells were as follows:

- Well RS-01, located approximately 22 feet from the harbor: 30 minutes.
- Well RS-05, located approximately 71 feet from the harbor: 1 hour and 17 minutes.
- Well RS-06, located approximately 78 feet from the harbor: 1 hour and 18 minutes.
- Well RS-14, located approximately 112 feet from the harbor: 4 hours and 21 minutes.

## 3.6 LNAPL RECOVERY PILOT STUDY

Farallon (2022b) conducted a pilot study to evaluate the feasibility of LNAPL removal from the Site. Pneumatic skimmer pumps were installed in monitoring wells RS-03, RS-15, and RS-19 with appurtenant equipment, controllers, and piping. Installation of the recovery system commenced on November 5, 2021, and was completed on November 7, 2021. System startup and shakedown were completed on November 8, 2021.

The EPA-approved scope of work consisted of 1 week of field operation. However, EPA later directed Pilot Thomas to extend the field operation for approximately 4 weeks to obtain information and evaluate system performance during the king tides (i.e., particularly high and low tides) that occurred on December 4 and 5, 2021.

The recovery system operated using pneumatic pumps equipped with floating intakes that were denser than LNAPL but less dense than water, which allowed for skimming of LNAPL in each well to an LNAPL thickness of less than 0.2 foot (2.5 inches). The frequency of pumping was adjusted to optimize the flow of LNAPL into the pump. To maximize the potential increase in available LNAPL in each of the selected recovery wells during lower tides, pumping frequency was kept relatively high. LNAPL recovery achieved during the pilot study confirmed that the use of pneumatic pumps is technically feasible for removal of LNAPL on groundwater at Hyde Street Harbor (Farallon 2022b).

## 3.7 INTERIM LNAPL RECOVERY

EPA directed Pilot Thomas to evaluate, select, design, and implement an active LNAPL recovery system based on the results from the pilot study discussed above. The purpose of the LNAPL recovery system is to reduce the volume of LNAPL in the subsurface, with the understanding that a subsequent Remedial Action Plan would be prepared in the future. The design of the LNAPL recovery system was based on the results from the pilot study, and consistent with the LNAPL recovery system used for the pilot test.

The interim LNAPL recovery system includes a combination of three pneumatic pumps, passive oleophilic absorbents placed into non-pumping wells, and bailing of LNAPL as needed. As LNAPL recovery has progressed, the volume of LNAPL recovered has decreased, as expected. Farallon estimates that as of October 21, 2022, approximately 240 gallons of LNAPL has been removed from the subsurface since the initiation of the pilot study and implementation of the interim LNAPL recovery. Figure 3 illustrates the apparent LNAPL thickness in July 2021 (prior to the pilot test); Figure 4 illustrates more-recent apparent LNAPL thicknesses measured in the groundwater monitoring wells.

## 3.8 SOIL VAPOR AND INDOOR AIR STUDY

Farallon (2023a and 2023b pending) conducted vapor intrusion evaluations at properties surrounding the Site to evaluate the potential for soil vapor intrusion into buildings that may include compounds released by R99 diesel on groundwater. Work included headspace sampling from wells known to contain LNAPL, and collecting and analyzing ambient air, indoor air, and soil vapor samples on the three properties closest to the R99 diesel release area. The ambient air, indoor air, and soil vapor sample collection and analyses were conducted in November 2022 and in June 2023 to capture "wet" and "dry" periods.

Analytical data were compared against air and soil gas screening levels for the TPH fractions (calculated by the Water Board) and against commercial/industrial ESLs for the VOCs. The Water Board calculated air and soil gas screening levels for the TPH fractions for the Site were not exceeded. Additionally, VOC concentrations exceeding the commercial/industrial ESLs were not detected in any of the subslab soil vapor samples. Benzene, ethylbenzene, and naphthalene were detected in indoor air samples at concentrations that typically exceeded their respective ESLs but by less than one order of magnitude. The relative values of subslab concentrations (more than an order of magnitude less than the ESLs) and indoor air concentrations (typically exceeding ESLs and consistent with typical indoor to outdoor air ratios) indicate the VOCs detected in indoor air are not attributable to vapor intrusion as a result of the R99 diesel release.

Given the higher concentrations of VOCs in indoor air relative to subslab soil vapor, localized indoor air sources are likely causing the higher indoor air concentrations. Building inspections identified the presence of volatile chemicals and cleaners in the properties where samples were collected. Lastly, the thickness of the relatively new and intact concrete slabs, some over several feet thick, would greatly impede the potential for vapor intrusion.

## 3.9 SUMMARY OF IMPACTS

The following section summarizes the nature and extent of R99 diesel impacts on the various media at the Site.

### 3.9.1 Soil Impact Nature and Extent

Analyses conducted at the Site show a close and direct correlation between R99 diesel in LNAPL and impacted soil. In areas where R99 diesel has been observed as LNAPL, R99 diesel in soil also has been observed. No areas where impacted soil was observed absent of impacted groundwater were identified during prior investigations. As such, the extent of impacted soil most-closely correlates with the presence of LNAPL. It should be noted that over time and with the twice-daily ebb and flow of the tides, LNAPL likely has spread from its earlier position (Figures 3 and 4), and in the process of spreading has become bound in soil near areas where LNAPL has been present.

### 3.9.2 Groundwater Impact Nature and Extent

Analyses conducted at the Site show a close and direct correlation between R99 diesel in LNAPL and impacted groundwater. In the areas where R99 diesel was observed as LNAPL, R99 diesel in groundwater also was observed. No areas where impacted groundwater was observed absent of nearby LNAPL on groundwater were identified during prior investigations. As such, the extent of impacted groundwater most-closely correlates with the presence of LNAPL. It should be noted that over time and with the twice-daily ebb and flow of the tides, LNAPL likely has spread from its earlier position, and in the process of spreading has had an opportunity to dissolve into the groundwater.

### 3.9.3 Soil Vapor and Indoor Air Impact Nature and Extent

The Water Board calculated air and soil gas screening levels for the TPH fractions for the Site were not exceeded. Additionally, soil vapor and indoor air evaluations indicated that VOC concentrations exceeding the commercial/industrial ESLs are not present in any of the subslab soil vapor samples and that adverse vapor intrusion attributed to the R99 diesel release is not occurring. VOCs detected in indoor air are not attributable to vapor intrusion as a result of the R99 diesel release. Localized indoor air sources not associated with the R99 diesel release are likely causing increased indoor air VOC concentrations. The soil vapor and indoor air evaluations found no evidence that chemicals from the R99 diesel release were adversely impacting indoor air.

# 4.0 CONCEPTUAL SITE MODEL AND RISK HAZARD ASSESSMENT

The conceptual site model (CSM) was presented in the Site Investigation Report and is summarized in this section. The CSM was developed to support identification of the source(s) of R99 diesel discharged from the Site to surface water in Hyde Street Harbor, and the evaluation and selection of steps necessary to remove the discharge or threat of discharge of R99 diesel into Hyde Street Harbor or adjacent shorelines. The CSM is based on the physical, chemical, and biological processes that control the transport, migration, and actual and/or potential impacts of contamination in soil, groundwater, surface water and/or sediments. This CSM supports identification of investigative data gaps and remedial decisions regarding potential future assessments or required remedial actions.

## 4.1 CHEMICALS OF CONCERN

R99 diesel is the COC for the discharge from the Site to surface water of Hyde Street Harbor, and is a COC for LNAPL on surface water, groundwater, and soil. The COCs in R99 diesel consist of TPHd, with minor amounts of TPH as gasoline (TPHg), TPHmo, and naphthalene.

Pre-existing contaminants also are present in soil and groundwater, which were released from prior fuel-related operations at the Site by ExxonMobil. Pre-existing contaminants present in soil and groundwater at locations up- and cross-gradient and in the vicinity of the Site from operations by ARCO; ChevronTexaco; Del Monte Foods, Inc.; Shell Oil; and Unocal include TPHd, TPHmo, TPHg, polycyclic aromatic hydrocarbons, metals, and methyl tertiary-butyl ether. These COCs are pre-existing conditions not associated with the R99 diesel release, and are not specifically addressed in this FS/RAP.

## 4.2 POTENTIAL RELEASE MECHANISMS

R99 diesel is inferred to have been released from the underground fuel supply pipelines at a depth of 3 to 4 feet bgs that extend between the remote fill port to the ASTs, and from the ASTs to the fuel dispenser. The specific release point has not been located, but has been identified as being between the remote fill port and the ASTs, possibly near monitoring wells RS-03, RS-04, RS-05, and RS-18 (Figure 3 in the Site Investigation Report).

## 4.3 MIGRATION PATHWAYS

R99 diesel released from the underground fuel supply pipelines at a depth approximately 3 to 4 feet bgs dispersed and migrated laterally and downward through unsaturated soil to tidally influenced groundwater at depths of approximately 4 to 10 feet bgs. R99 diesel mounded as LNAPL on groundwater and dispersed laterally, as shown on Figure 3. R99 diesel migrated north with groundwater, and discharged to the surface water of Hyde Street Harbor.

R99 diesel as LNAPL floating on the surface water was dispersed by wind, waves, and tidal influences prior to containment by absorbent booms.

## 4.4 NATURE AND EXTENT OF R99 DIESEL

The nature and extent of R99 diesel in soil, as LNAPL on groundwater, and as dissolved-phase in groundwater have been delineated.

### 4.4.1 Extent of R99 Diesel in Soil

The nature and extent of R99 diesel in soil is limited to the area adjacent to the LNAPL plume.

TPHd and/or TPHmo was detected in soil samples collected from borings for installation of monitoring wells RS-11, RS-16, RS-22, and RS-24 through RS-26. However, chemicals indicative of R99 diesel were not detected in soil samples from these locations, with the exception of one soil sample collected from the boring for installation of monitoring well RS-16 at a depth of 7 feet bgs. The analytical laboratory concluded that the soil sample collected from the boring for well RS-16 contained approximately greater than 20 percent R99 diesel. The non-R99 diesel TPHd and TPHmo detected in these soil samples may be residuals released from prior operations, or associated with uncontrolled fill.

Figure 5 shows the Site with color indications identifying locations where R99 diesel was not detected in soil or groundwater (green indicators), or where R99 diesel was observed in soil or groundwater or had R99 diesel LNAPL (red indicators)

### 4.4.2 Extent of LNAPL on Groundwater

The extent of R99 diesel as LNAPL greater than 0.2 foot thick has been delineated and is shown on Figure 3. Interim LNAPL recovery has been occurring since completion of the Site Investigation Report. Figure 4 is a composite apparent LNAPL thickness map showing average LNAPL thicknesses measured in groundwater monitoring wells in October/November 2022. As shown on the figure, the amount of LNAPL observed in the groundwater monitoring wells is significantly less than earlier measurements taken before interim LNAPL recovery commenced.

### 4.4.3 Extent of Dissolved-Phase R99 Diesel in Groundwater

The extent of dissolved-phase R99 diesel in groundwater collected from monitoring wells RS-11, RS-16, RS-22, and RS-24 through RS-26 has been defined (Figure 5).

TPHd or TPHmo concentrations were detected in groundwater samples collected from monitoring wells RS-11, RS-16, RS-22, and RS-24. However, chemicals indicative of R99 diesel were not detected in the groundwater samples collected from monitoring wells RS-11, RS-16, RS-22, and RS-24. TPHd and TPHmo were not detected in groundwater samples collected from monitoring wells RS-25 and RS-26. The TPHd and TPHmo detected in groundwater may be residuals released from prior operations, or migration from fill placed at the Site.

Figure 5 shows the Site with color indications of locations where R99 diesel was not detected in soil and groundwater (green indicators), and where R99 diesel was observed in soil or groundwater or had R99 diesel LNAPL (red indicators).

### 4.4.4 Extent of R99 Diesel in Soil Vapor and Indoor Air

The extent of R99 diesel in soil vapor and indoor air has been evaluated and is less than screening levels for TPH and VOCs, indicating that the R99 diesel is not contributing to unacceptable vapor intrusion.

## 4.5 SENSITIVE RECEPTORS

Hyde Street Harbor is the sensitive receptor where R99 diesel as LNAPL has been measured in the subsurface within 20 feet of the shoreline ,and where LNAPL floating on surface water has been observed in the near offshore water of Hyde Street Harbor.

A Conceptual Exposure Model provides the basis for a comprehensive evaluation of the risks to human and marine biota by identifying the mechanisms through which receptors may be exposed to potential chemicals of concern. The main considered receptor populations are on-Site commercial workers and construction workers. Recreational water users and marine biota are the main considered receptor population in nearby open water. The primary on- and off-Site risk and hazard is through direct contact.

### 4.5.1 Direct Contact Risk and Hazard Exposure for Commercial and Construction Workers

The primary on-Site risk is direct contact by commercial and construction workers to areas at the Site where R99 diesel is present. Risk can be calculated for direct contact impacts using the Water Board Environmental Screening Levels Workbook and associated default values for commercial and construction worker presented in the Water Board (2019b) Environmental Screening Levels (ESL) tables.

### 4.5.2 Direct Contact Risk and Hazard Exposure for Recreational Water Users and Marine Biota

The primary off-Site risk is direct contact by recreational water users and marine biota to areas where R99 diesel is present. Screening levels for TPHd for saltwater ecotoxicity are provided in the Water Board Tables. No numeric guidelines have been established for recreational water users. As such, absence of visible oily sheen on the surface of the water is considered the risk level that should be attained.

### 4.5.3 Water Supply Wells

According to the Site Investigation Report, no water-supply wells were identified within 1 mile of the Site (California State Water Resources Control Board 2022). The closest active water-supply well, identified as State Well #3810011-008, is located at Golden Gate Park, approximately 3 miles southwest of the Site. The status of this water-supply well was identified as “active raw.”

### 4.5.4 Surface Water Bodies

Hyde Street Harbor is directly adjacent to the Site, and is part of San Francisco Bay.

### 4.5.5 Residential Buildings

No residential buildings are present in the vicinity of the Site.

### 4.5.6 Public Use Areas Within 200 Feet

Public use buildings and other areas in the vicinity of the Site include a restaurant, a souvenir shop, a fish market, a police substation, a pier, and Hyde Street Pier National Park.

## 4.6 DATA GAPS

No data gaps were identified related to identification of the source(s) of R99 diesel discharged from the Site to surface water in Hyde Street Harbor or to support of the evaluation and selection of the steps necessary to remove the discharge or threat of discharge of R99 diesel into Hyde Street Harbor or adjacent shorelines (Farallon 2022a).

# 5.0 REMEDIAL ACTION OBJECTIVES AND CLEANUP GOALS

The COCs for the Site are R99 diesel and its constituent components, in soil, groundwater, and soil vapor. Remedial actions will address concentrations of these constituents in environmental media exceeding applicable standards or guidelines. These remedial action objectives (RAOs) have been divided into short-term RAOs (st-RAOs) and longer-term RAOs (lt-RAOs).

## 5.1 SHORT-TERM REMEDIAL ACTION OBJECTIVES

St-RAOs address RAOs that can be readily implemented within 1 year following receipt of regulatory approval, permitting, and arrangement of logistical considerations. The following list of st-RAOs for protection of human health and environmental receptors were developed based on investigative data:

- st-RAO Soil: Reduction of mass of readily accessible R99 diesel from soil to reduce risks to human receptors, including workers and construction workers.
- st-RAO LNAPL: Reduction of mass of readily accessible R99 diesel as LNAPL to reduce risks to human receptors, and potentially acting as a secondary source of contamination.
- st-RAO Soil Vapor: Protection of human receptors from exposures to COCs in soil vapor in indoor air.
- st-RAO Surface Water: Prevention of R99 diesel sheen from entering surface waters.

## 5.2 LONG-TERM REMEDIAL ACTION OBJECTIVES

The following list of lt-RAOs for protection of human health and environmental receptors were developed based on investigative data. These lt-RAOs are intended to achieve closure, and are based on low-threat closure criteria:

- lt-RAO Soil: Reduction of R99 diesel in soil to the extent practicable.
- lt-RAO Groundwater: Reduction of R99 diesel in groundwater and removal of LNAPL to the extent practicable.
- lt-RAO Soil Vapor: Protection of human receptors from exposures to COCs in soil vapor in indoor air.
- lt-RAO Surface Water: Protection of human and marine receptors from exposures to COCs entering surface water at concentrations exceeding protective levels.

## 5.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Prior to implementing a remedial action, pertinent federal, state, and local regulatory requirements must be identified. Such requirements may guide or impact the selection of a remedial approach. While preparing the FS/RAP for the Site, Farallon identified ARARs from policy or guidance documents that may be pertinent to evaluating and implementing remedial options.

ARARs typically fall into three categories: chemical-specific, location-specific, and action-specific. Chemical-specific ARARs set health or risk-based concentration limits or ranges in various environmental media for specific hazardous substances. During the planning process, these requirements are used to establish site cleanup levels, or to provide a basis for calculating cleanup levels for the media of interest. For sites where discharge is necessary, they also are used to define an acceptable level of discharge, which will determine treatment and disposal requirements, and to assess the effectiveness of the remedial alternatives. During implementation of a remedial action, chemical-specific ARARs are used to define acceptable exposure levels.

Location-specific ARARs set restrictions on the types of remedial activities that can be performed based on specific locations, such as floodplains, wetlands, historical places, and sensitive ecosystems or habitats.

Action-specific requirements are triggered by the particular remedial activities selected to accomplish the cleanup. After remedial alternatives have been developed, action-specific ARARs that specify performance levels, actions, technologies, and specific levels for discharge of residual chemicals provide a basis for assessing the feasibility and effectiveness of the remedies.

### 5.3.1 Chemical-Specific Applicable or Relevant and Appropriate Requirements

Chemical-specific ARARs include those that pertain to cleanup goals, to determine that sufficient treatment has been conducted to demonstrate that the RAOs have been achieved, and that remaining contamination does not pose a significant risk to human health or the environment. The final remedial design for the Site will be based on meeting the chemical-specific ARARs, which potentially are:

- The Safe Drinking Water Act, including maximum contaminant levels (MCLs), MCL goals, and secondary MCLs;
- EPA Superfund Guidance, including regional screening levels (RSLs) and health advisories;
- The Toxic Substances Control Act;
- The California Safe Drinking Water Act, including MCLs, secondary MCLs, public health goals, and drinking water notification levels;

- The Porter-Cologne Water Quality Control Act;
- Water Board ESLs; and
- The California State Water Resources Control Board Low-Threat Closure Policy[3] and established precedent.

### 5.3.2 Location-Specific Applicable or Relevant and Appropriate Requirements

Location-specific ARARs may set restrictions on activities in specific locations, such as in the Port of San Francisco. The Water Board (2022) Basin Plan defines groundwater beneficial uses for specific locations to be achieved in accordance with Resolution 92-49. Resolution 92-49 provides for "attainment of either background water quality, or the best water quality which is reasonable if background levels of water quality cannot be restored, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible."

### 5.3.3 Action-Specific Applicable or Relevant and Appropriate Requirements

Action-specific ARARs may set controls or restrictions for particular treatment and disposal activities related to hazardous waste remediation and management. Federal, state, and local guidelines were used to identify potential action-specific ARARs for the Site, which may include:

- The Occupational Health and Safety Act (Occupational Safety and Health Administration; Part 1910 of Title 29 of the Code of Federal Regulations [29 CFR 1910 120]);
- The Resource Conservation and Recovery Act (40 CFR Part 261, 262);
- Clean Water Act Regulations (40 CFR Parts 6, 50, 61, 63); Clean Water Act, Section 1342 of Title 33 of the United States Code (33 U.S.C. Section 1342), and regulations promulgated thereunder (40 CFR Part 122); the Clean Water Act, 33 U.S.C. Sections 1317-1318, and regulations promulgated thereunder (40 CFR Part 403);
- The Clean Air Act, 42 U.S.C. Section 7401 et seq., and regulations promulgated thereunder;

[3] Although the California State Water Resources Control Board Low-Threat Closure Policy was written to address practical implementation of Resolution 92-49 in the context of petroleum USTs, it provides useful guidance on how to implement and interpret Resolution 92-49 at all contaminated sites. The Low-Threat Closure Policy provides clarification on what constitutes a reasonable time frame to achieve compliance with water quality objectives, i.e., describing what is reasonable as being prior to the expected need for use of the affected groundwater.

- The Hazardous Materials Transportation Act of 1994, 49 U.S.C. Sections 5101-5127, and regulations promulgated there under (49 CFR Parts 107, 171-177); 29 U.S.C.;
- Land Disposal Restrictions (40 CFR Part 268); and
- The California Environmental Quality Act (CEQA), Section 21000 et seq. of the California Public Resources Code, and its implementing regulations.

### 5.3.4 Applicable or Relevant and Appropriate Requirement Waivers

ARARs may be waived under any one of the following circumstances:

- The selected remedial action is an interim measure and will become part of a total remedial action that will attain ARARs when completed; or
- Compliance with the ARARs will result in greater risk to human health and the environment than other alternatives; or
- Compliance with the ARARs is technically impracticable from an engineering perspective; or
- The selected remedial action will attain a standard of performance equivalent to the ARARs through use of another method or approach; or
- The ARAR is a state requirement that the state has not consistently applied or demonstrated the intention to consistently apply in similar circumstances.

An evaluation of the selected remedial alternative for the R99 diesel contamination was conducted to determine whether any of the above exceptions might apply. The effectiveness of the remediation will be evaluated during the operating life of the selected remedial alternative to determine whether compliance with the ARARs is technically feasible from an engineering perspective.

## 5.4 APPLICATION OF WATER CODE SECTION 13304 AND STATE WATER RESOURCES CONTROL BOARD RESOLUTION NO. 92-49

Resolution 92-49 (as amended on April 21, 1994 and October 2, 1996), titled "Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304," details and provides the context for how cleanups are to be conducted. Specifically, Resolution 92-49 provides for the following (emphasis added):

> III. The Regional Water Board shall implement the following procedures to ensure that dischargers shall have the **opportunity to select cost-effective methods for** detecting discharges or threatened discharges and methods for **cleaning up or abating the effects** thereof. The Regional Water Board shall:

A. Concur with any investigative and cleanup and abatement proposal which the discharger demonstrates and the Regional Water Board finds to **have a substantial likelihood to achieve compliance, within a reasonable time frame, with cleanup goals and objectives that implement the applicable Water Quality Control Plans and Policies adopted by the State Water Board and Regional Water Boards**, and which implement permanent cleanup and abatement solutions which do not require ongoing maintenance, wherever feasible;

C. **Require the discharger to consider the effectiveness, feasibility, and relative costs of applicable alternative methods for investigation, and cleanup and abatement. Such comparison may rely on previous analysis of analogous sites, and shall include supporting rationale for the selected methods**;

G. Ensure that **dischargers are required to clean up and abate the effects of discharges in a manner that promotes attainment of** either background water quality, or **the best water quality which is reasonable if background levels of water quality cannot be restored, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible**;[4] in approving any alternative cleanup levels less stringent than background, apply Section 2550.4 of Chapter 15, or, for cleanup and abatement associated with underground storage tanks, apply Section 2725 of Chapter 16, provided that the Regional Water Board considers the conditions set forth in Section 2550.4 of Chapter 15 in setting alternative cleanup levels pursuant to Section 2725 of Chapter 16; any such alternative cleanup level shall:

1. Be consistent with maximum benefit to the people of the state;
2. Not unreasonably affect present and anticipated beneficial use of such water; and

[4] This language in Resolution No. 92-49 mirrors the language in California Water Code Section 13000.

> 3. Not result in water quality less than that prescribed in the Water Quality Control Plans and Policies adopted by the State and Regional Water Boards; ....

As stated, selected remedial actions must consider all of the above components. This FS/RAP considered the above components to arrive at the preferred/selected remedial method that will attain the required outcome in a time frame that will not impede the current or anticipated future use of any water resource.

## 5.5 DESIGNATED BENEFICIAL USES OF COASTAL WATER

Designated beneficial uses of coastal waters identified in the Water Board (2022) Basin Plan include industrial service supply, industrial process supply, commercial and sport fishing, shellfish harvesting, estuarine habitat, fish migration, preservation of rare and endangered species, fish spawning, wildlife habitat, water contact recreation, noncontact water recreation, and navigation (Water Board 2019a).

## 5.6 DESIGNATED BENEFICIAL USES OF GROUNDWATER

Designated beneficial uses identified for groundwater in the Water Board Basin Plan include municipal and agricultural uses. Industrial service supply and industrial process supply also are identified as potential beneficial uses (Water Board 2019a). Groundwater beneath the Site is not potable, reflects the salinity of surrounding ocean water, does not otherwise meet the criteria referenced in State Water Board Resolution No. 88-63, "Sources of Drinking Water," and is not a designated beneficial use.

It is understood that the lack of numerical water quality objectives in industrial service or industrial process supply water does not alleviate the need to clean up and abate the effects of discharges in a manner that promotes attainment of either background water quality or the best water quality reasonable under the circumstances, if background levels of water quality cannot be reasonably restored.

## 5.7 PROPOSED CLEANUP GOALS

The following sections present the proposed st- and lt-RAO cleanup goals with associated explanation and/or approach.

### 5.7.1 st-RAO Soil: Reduction of Readily Accessible R99 Diesel from Soil

- Readily accessible areas of R99 diesel in soil will be evaluated.
- The multiple ongoing uses of the Site area need to be considered; any benefit from reducing R99 diesel must be balanced against safety concerns, disruptions to ongoing operations, and stakeholder concerns.

### 5.7.2 st-RAO LNAPL: Reduction of Readily Accessible R99 Diesel LNAPL

- LNAPL concentrations will be removed using active or passive systems to the extent reasonable and practicable.
- LNAPL will be removed in a manner that minimizes its spread into previously uncontaminated zones; recovery and disposal techniques appropriate to the hydrogeologic conditions at the Site and that properly treat, discharge, or dispose of recovery by-products in compliance with applicable laws will be used.

### 5.7.3 st-RAO Soil Vapor: Protection of Human Receptors from Soil Vapors in Indoor Air

- Soil vapor and indoor air concentrations have been evaluated. Results from soil vapor and indoor air evaluation were compared against air and soil gas screening levels for the TPH fractions and against commercial/industrial ESLs. Concentrations of COCs attributed to the R99 diesel release are less than Water Board screening levels, consequently no soil vapor or indoor air mitigation will be required.

### 5.7.4 st-RAO Surface Water: Prevention of R99 Diesel Sheen from Entering Surface Waters

- Petroleum sheen on surface water will be reduced to the extent feasible.

### 5.7.5 lt-RAO Soil: Reduction of Readily Accessible R99 Diesel from Soil

- Readily accessible areas of R99 diesel in soil will be evaluated. Soil concentrations will be compared against commercial/industrial shallow exposure and construction worker Water Board ESLs for TPHd and the components of R99 diesel.
- If concentrations of COCs attributed to the R99 diesel release are less than Water Board ESLs or consistent with low-threat closure criteria, no additional soil mitigation related to lt-RAO Soil will be required.

### 5.7.6 lt-RAO Groundwater: Reduction of R99 Diesel in Groundwater, and Removal of LNAPL to the Extent Practicable

- LNAPL at the Site will be reduced to the extent feasible; groundwater concentrations will be compared against saltwater ecotoxicity Water Board ESLs for TPHd and the components of R99 diesel.
- If LNAPL at the Site is reduced to the extent feasible and COCs attributed to the R99 diesel release are less than Water Board ESLs or consistent with low-threat closure criteria, no additional groundwater mitigation will be required.

### 5.7.7 lt-RAO Soil Vapor: Protection of Human Receptors

- Soil vapor and indoor air concentrations are less than Water Board screening levels. Consequently, no soil vapor or indoor air mitigation is required.

### 5.7.8 lt-RAO Surface Water: Protection of Human and Marine Receptors

- Petroleum sheen on surface water will be reduced to the extent feasible; groundwater concentrations will be compared against saltwater ecotoxicity Water Board ESLs for TPHd and the components of R99 diesel.

# 6.0 REMEDIAL TECHNOLOGY SCREENING AND EVALUATION

The objective of the FS/RAP process is to identify, evaluate, and select a remedial alternative that will achieve the RAOs, i.e., that will protect public health, including on-Site workers, and the environment from unreasonable risks associated with Site-related contaminants.

Information from past investigations and results from ongoing monitoring of previously implemented interim remedial actions were used in the preparation of this FS/RAP to identify appropriate remedial technologies, and to evaluate remedial action alternatives (RAAs).

## 6.1 NATIONAL CONTINGENCY PLAN CRITERIA

Consistent with EPA guidance and NCP guidelines, the following NCP criteria were used to evaluate the remedial alternatives that were considered:

- Overall protection of public health and the environment (also an RAO)
- Compliance with ARARs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost effectiveness
- State acceptance
- Community acceptance (not discussed until receipt of regulatory approval of FS/RAP)

In addition to the above criteria, both Environmental Impact, a qualitative evaluation of an action's impact on the environment (e.g., air quality, carbon footprint), and Climate Change Impact, how climate change may complicate remediation, are considered, as it is a goal of the City of San Francisco to limit deleterious environmental impacts.

## 6.2 GENERAL RESPONSE ACTIONS

This section presents general response actions (GRAs) that will be considered to address the RAOs for R99 diesel-impacted areas. GRAs provide the framework for specific technologies and process options to be considered to meet the RAOs for the Site. The following are the GRAs considered:

- No Action
- Soil Removal
- LNAPL/Groundwater Removal

- In-Situ Treatment
- Monitored Natural Attenuation (MNA)
- Physical Barrier.

The GRAs and their associated technologies and process options are summarized below and in Table 1.

#### 6.2.1 No Action

The No Action GRA provides a baseline for comparison with other alternatives, and is required by the NCP, the EPA (1988a) *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*, and the EPA (1988b) *Guidance on Remedial Actions for Contaminated Groundwater and Superfund Sites* as part of the feasibility study process. The No Action GRA is not considered a remedial technology, but is included here and will be evaluated as a remedial alternative. As there is still discharge of fuel into open water, the No Action alternative is not considered feasible, and is not considered other than to benchmark remedial costs.

#### 6.2.2 Soil Removal

The Soil Removal GRA involves technologies that remove the impacted soil medium from the Site. The R99 diesel-impacted medium is generally in shallow saturated soil; thus, the potential removal technology would include soil excavation. Complete soil excavation may not be viable because of the presence of nearby operating businesses and public facilities that may be impacted by the removal action. This alternative may require dismantling and shutting down all or part of the operating businesses and public facilities.

Limiting soil excavation to only portions of the Site with greater access and less interruption of business operations and public facilities may be effective in removing much of the impacted soil.

#### 6.2.3 LNAPL/Groundwater Removal

LNAPL/Groundwater Removal (Product Skimming or Pump and Treat) GRAs are performed to remove COCs in groundwater. Process options for groundwater extraction include LNAPL/groundwater extraction wells and LNAPL/groundwater collection trenches. The LNAPL/Groundwater Removal GRA via extraction wells has been in operation in a limited area of the Site; apparent LNAPL thicknesses are significantly less than when the release was first identified. This GRA could be an effective technology, but would be complicated by the effects of tidal water level fluctuations. Pumping could induce infiltration from the ocean and increase salinity, further degrading groundwater.

#### 6.2.4 In-Situ Treatment

In-Situ Treatment GRAs are technologies that treat or stabilize COC-affected media in-place (i.e., without removing the media). In-situ technologies include chemical/physical treatment technologies such as substrate injections to enhance biological remedial processes, in-well stripping, air sparging, chemical oxidation, permeable reactive barriers, and MNA.

### 6.2.5 Monitored Natural Attenuation

MNA GRAs are technologies that establish that attenuation is continuing or ongoing at a site without the need for active treatment. In many instances, the subsurface geochemistry is such that soil or groundwater attenuation is naturally occurring. Collecting natural attenuation parameters typically is necessary to establish that natural attenuation is occurring. Natural attenuation is further established by conducting periodic monitoring to show that mass or chemical concentrations are being reduced.

### 6.2.6 Physical Barrier

Physical Barrier GRAs are technologies that prevent migration of COC-affected media (i.e., without removing the media). Physical barrier technologies may include sheet metal walls and cement/cement-bentonite walls.

GRAs and associated physical barriers are identified and screening results presented in Table 1. The GRAs and associated process technologies that cannot be applied were eliminated from further consideration.

## 6.3 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES

The screening of GRAs and process options consists of preliminary and final levels of evaluation, followed by selection of representative process options. This process focuses on the technologies that directly relate to the GRAs identified in Section 6.2, General Response Actions, summarized in Table 1, and address the RAOs discussed in Section 5.7, Proposed Cleanup Goals.

The following sources of information were used to identify alternative technologies for screening:

- *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA 1988a)
- *Guidance on Remedial Actions for Contaminated Groundwater and Superfund Sites* (EPA 1988b)
- An Approach for Evaluating the Progress of Natural Attenuation in Groundwater (EPA 2011)

Alternatives for remediation are developed by assembling technologies into alternatives that meet the Site RAOs on a unit-wide basis, and address Site-related COCs. This process identifies and screens potential technologies applicable to each GRA. Technologies that cannot be implemented are eliminated during the screening process. Process/treatment options representative of the technologies retained for consideration are identified and discussed in detail in this section.

The following sections identify and discuss screened remediation technologies and process options based on their effectiveness, implementability, and relative cost. This screening evaluation was conducted to determine the remediation technologies and options most-appropriate for development into RAAs that meet RAOs.

A list of remediation technologies, their process options, and screening evaluation results are presented in Table 1. Remediation technologies and process options not applicable to the COCs and/or Site conditions were eliminated from further consideration. Several remediation technologies may compose an RAA.

### 6.3.1 Initial Screening of Remedial Technologies

Initial screening was performed first by expanding each GRA into a series of available technologies and processes that address the remedial requirements. Available technologies and processes were further subdivided into specific process options. Each of the technologies identified as a part of a GRA was screened against the RAOs, taking into account the expected effectiveness, implementability, and cost of the technology.

Technologies and process options under each GRA were identified and screened at a preliminary level, shown in Table 1. Some of the process options were eliminated from further consideration to better focus the remedial technology and process option screening. The reasons for eliminating certain process options at this stage included the following: the process is impractical to implement; the process is unnecessary in light of the RAOs; the process is too costly; the process does not provide the necessary treatment; and the process is not technically or practically achievable for the Site.

### 6.3.2 Criteria for Screening Remedial Technologies and Process Options

Process options for each remedial technology were comparatively evaluated against the three criteria of effectiveness, implementability, and relative cost, shown in Table 1.

#### 6.3.2.1 Effectiveness Evaluation

The evaluation of the effectiveness of a process option is based on the following sub-criteria:

- The ability to meet the RAOs.
- Potential impacts on public health and the environment during implementation at the Site.

Based on the above considerations, GRAs and process options were categorized as:

- **Effective** if they can meet the RAOs and protect public health and the environment.
- **Not effective** if they cannot meet the RAOs and protect public health and the environment.

#### 6.3.2.2 Implementability Evaluation

Implementability encompasses the technical and administrative feasibility of setting in place a remedial technology and process option(s). This evaluation emphasizes the following:

- Availability of equipment and skilled manpower to implement the technology.
- Ability to obtain necessary permits.
- Availability of treatment, storage, and disposal facilities close to the Site (if required).
- Time period for implementation.
- The ability to obtain access to properties where components of remedial systems must be installed.

GRAs and process options are considered to be:

- **Implementable** if they have been used at similar sites and are commercially available, and if site constraints do not unduly prevent its implementation.
- **Difficult to implement** if they have been used at similar sites but problems relating to capacity, site characteristics, or permitting issues were experienced that hampered implementability at the site.
- **Not implementable** if they have not been demonstrated for treatment of the COCs, or are incompatible with the media or other Site-related item.

#### 6.3.2.3 Relative Cost Evaluation

Relative capital costs and operation and maintenance (O&M) costs are used in place of detailed estimates during this level of screening. For each GRA, each technology is evaluated by comparing costs versus effectiveness relative to other technologies that achieve similar goals to treat similar compounds (e.g., granular activated carbon adsorption would be compared to chemical oxidation for treatment of VOCs). Relative costs were classified as Low, Moderate, High, or Very High, with the lowest cost identified as Low and the highest cost identified as Very High.

## 6.4 REMEDIAL TECHNOLOGY SCREENING

### 6.4.1 No Action

The No Action GRA involves performing no additional activities to remediate a site. For the R99 diesel contamination, the No Action GRA would be discontinuation of interim LNAPL recovery and groundwater monitoring, and abandonment of groundwater monitoring wells.

#### 6.4.1.1 Effectiveness

The No Action GRA would not actively remediate R99 diesel. However, because natural biological and physical processes in place at the Site are attenuating existing R99 diesel, ongoing degradation of R99 diesel would be expected, but would not be monitored, as it continued for the foreseeable future. Given that fuel releases into open water continue to be observed, No Action is not considered to be effective.

#### 6.4.1.2 Implementability

The No Action GRA is implementable.

#### 6.4.1.3 Relative Cost

The No Action GRA does not require any additional construction equipment or remediation activities other than abandonment of existing groundwater monitoring wells and interim remedial structures, and reporting their abandonment. The relative capital costs are low, and there would be no O&M costs. Hence, the overall relative cost for the No Action GRA is low. A feasibility study cost estimate for this alternative is estimated as follows:

| | |
|---|---|
| Regulatory interface and administrative issues: | $100,000 |
| Well abandonment: | $150,000–$250,000 |
| Total estimated costs: | $250,000–$350,000 |

The above estimates assume preparation of a work plan and a final report for groundwater monitoring well abandonments, and subsequent costs for the groundwater monitoring well abandonments.

#### 6.4.1.4 Screening Results

The No Action GRA is not considered effective as it would not achieve the RAOs. It was not retained for further evaluation because it is not appropriate for the R99 diesel release. Inclusion of the No Action alternative in the feasibility study screening is required by the NCP to provide a baseline for comparison with other GRAs.

### 6.4.2 Soil Removal

Removal technologies are used to extract contaminated media. The removed medium generally is disposed of with or without treatment. The Soil Removal GRA was retained as a potential GRA.

#### 6.4.2.1 Effectiveness

The Soil Removal GRA could be an effective technology to achieve RAOs, particularly if impacted soil in the groundwater zone was removed. Given the constraints on the Site of an operating parking lot, commercial fishing operations using a pier, commercial shops, community resources, and underground utilities in the area, not all impacted soil at the Site could be removed. Partial soil removal might be more effective if paired with another GRA.

#### 6.4.2.2 Implementability

The Soil Removal GRA would be implementable at the Site, but would be complicated by the constraints identified above. Furthermore, given the shallow groundwater depth and the likely presence of R99 diesel sorbed onto a smear zone (the vertical extent of tidal fluctuation), removal of soil that extends to the lowest tides would be needed for this GRA to be effective. Shoring, cutoff walls, and dewatering of encountered groundwater likely would be required to effectively remove accessible impacted soil and groundwater associated with R99 diesel. Additionally, because the removal action would be limited and might not remove all impacted soil, LNAPL and R99 diesel-impacted water (albeit lower quantities and concentrations) might migrate to and re-contaminate recently excavated/ cleaned areas of the Site.

Site excavation would have significant impacts on ongoing operations at the Site, and may require shutting down ongoing activities for months or longer. This option also may impact tourism and related businesses, and may not be acceptable to affected parties. The duration of the work could be controlled by limiting the extent of excavation; however, the more limited the soil removal, the less benefit received.

#### 6.4.2.3 Relative Cost

The Soil Removal GRA has a high capital cost. Overall, the Soil Removal GRA has a high to very high relative cost. Soil excavation likely would require shoring and groundwater dewatering, extensive permitting, utility protection or removal and reinstallation, removal of existing monitoring wells and potential replacement, and high disposal costs. Implementation of the Soil Removal GRA would trigger the need for an evaluation of potentially significant adverse environmental impacts from such a significant "project," in accordance with CEQA. The CEQA evaluation would require a complete analysis of all potentially significant adverse impacts to the environment from the removal project, an evaluation of other viable alternative projects with less-significant environmental impacts, and mitigation of all significant adverse impacts to a level of insignificance. The CEQA analysis for the Soil Removal GRA itself might result in rejection of this remedial alternative because of the significant adverse environmental impacts from its implementation. Some of the complications identified above might be reduced by limiting the excavation to the portion of the Site most-impacted by the R99 diesel release.

Full Soil Removal GRA would require closure of the parking area, dismantling of the pier, closure of access to buildings such as the police department substation and the harbormaster office, and sufficient shoring to ensure no structural damage to the buildings. It would also require removal of portions of the underground fuel line connecting the ASTs to the fuel dispensers, removal of impacted soil, and removal of aboveground fences and concrete curbs while the work was being conducted. There also would be significant construction and truck traffic to accommodate the soil-removal activities. Once the area had been excavated, the area would need to be restored. Full Soil Removal GRA has not been costed, but would be expected to be in the multimillions of dollars (anticipated over $10 million).

A limited Soil Removal GRA that targets areas with the most LNAPL and along the release area also was considered. This limited Soil Removal GRA would require closure of the parking area and the pier to automobile traffic to remove portions of the underground fuel line connecting the ASTs to the fuel dispensers and impacted soil. It also would require removal of aboveground fences and concrete curbs while the work was being conducted. The preliminary feasibility study cost estimate for this alternative is approximately $1,500,000, as detailed in Table 2.

The above estimate assumes the following major components:

- Soil excavation would be completed over an approximately 3,000-square-foot collective area dug to a depth of 12 feet bgs.
- Soil would be disposed of as non-Resource Conservation and Recovery Act hazardous waste.

The above estimate DOES NOT include the following major components:

- Costs associated with CEQA compliance.
- Replacement of the fuel pipeline.
- Compensation (if any) to neighboring establishments for lost business.

These items described above that were not included in the cost estimate, if realized, are expected to be substantial, and may be necessary additional costs that would need to be added to the cost analysis for this Alternative, if they are required. Consequently, the overall relative cost for this alternative is very high.

#### 6.4.2.4 Screening Results

The limited Soil Removal GRA balances reduction of R99 diesel mass in soil and/or groundwater at the Site with substantial Site access and logistics issues by addressing the area where LNAPL historically has been greatest and is bound in soil. The real and substantial risks related to excavations adjacent to operating businesses and ongoing community activities and the increased vehicular activity needed to manage the Soil Removal GRA system make it far from an ideal solution. However, by limiting the size and scope of soil removal to accessible areas with the greatest historical LNAPL thicknesses, this alternative provides a worthwhile method to reduce R99 diesel mass .

### 6.4.3 LNAPL/Groundwater Removal

The LNAPL/Groundwater Removal (total fluids recovery with product separation or pump and treat) GRA would involve LNAPL and groundwater extraction through extraction trenches or wells.

#### 6.4.3.1 Effectiveness

The LNAPL/Groundwater Removal GRA via extraction well(s) can be an effective technology at the appropriate site. However, it would not be effective at the Site because of the shallow groundwater, proximity to the open sea, and the induced infiltration from the ocean that pumping would cause, increasing salinity and further degrading groundwater.

Skimming of LNAPL commenced with a pilot study in November 2021 and continues to the present. To date, approximately 300 gallons of R99 diesel LNAPL has been recovered. Recovery has significantly decreased in the past 2 months, as most groundwater monitoring wells have less than 0.3 foot of LNAPL. Nevertheless, continued LNAPL skimming is recommended as long as recoverable LNAPL is present.

Using groundwater extraction to recover LNAPL would have limited effectiveness, as causing LNAPL to move as freely as groundwater would be problematic, particularly because it has been smeared across soil through the tidal changes that occur at the Site. In-situ heating of the ground might help, but would be complicated due to the tidal changes and the proximity to open water, and potentially deleterious to nearby marine life.

#### 6.4.3.2 Implementability

The LNAPL/Groundwater Removal GRA beyond LNAPL recovery does not appear to be implementable at the Site because of the shallow groundwater and its proximity to the open sea. Pumping would induce infiltration from the ocean, increasing salinity and further degrading groundwater, and would not be expected to be effective in reducing 99 diesel concentrations in a reasonable time frame.

#### 6.4.3.3 Relative Cost

The LNAPL/Groundwater Removal GRA would require installation of the extraction well(s) or collection trenches and associated infrastructure, and ongoing O&M of the wells and infrastructure, which collectively have a high cost. Overall, containment via groundwater extraction well(s) has a high cost.

#### 6.4.3.4 Screening Results

If the LNAPL/Groundwater Removal GRA were to be implemented, a slight increase in the rate of R99 diesel reduction at the Site might occur; however, LNAPL likely would remain, and groundwater would continue to have elevated salinity concentrations.

Based on its lack of effectiveness, difficulty in implementation, and relative high cost, the LNAPL/Groundwater Removal GRA was not retained for detailed evaluation. Continuation of LNAPL skimming was retained for detailed evaluation.

### 6.4.4 In-Situ Treatment for Groundwater

In-situ treatment involves reduction of Site-related COC concentrations in groundwater without pumping it to the surface for treatment. In-situ treatment technologies can be chemical, physical, thermal, or biological technologies that treat groundwater in-place.

In-situ treatment technologies intercept, immobilize, or degrade compounds in the subsurface to shorten the time required for remediation. Passive technologies such as permeable reactive barriers require little maintenance. Active in-situ technologies enhance the removal rate of Site- related COCs, which may not be possible via pump-and-treat technology.

Three in-situ treatment process options were screened: In-Situ Chemical Oxidation (ISCO); In-Situ Thermal Desorption (ISTD); and Surfactant Injection with Groundwater Extraction and Treatment, each described in the following sections.

#### 6.4.4.1 In-Situ Chemical Oxidation

ISCO is an aggressive technology that involves injection of chemical oxidants that destroy organic compounds in groundwater. Complete oxidation of compounds results in their breakdown into less-toxic compounds such as carbon dioxide, water, and chloride anions. ISCO can significantly increase the mass transfer between residual contaminated soil and groundwater, subsequently destroying COC mass in a shorter period. A number of factors affect the performance of this technology, including oxidant delivery to the subsurface, oxidant type, dose of oxidant, COC type and concentration, and non-COC oxidant demand.

Commonly used oxidants include persulfate, permanganate, and hydrogen peroxide. Permanganate could effectively oxidize Site-related COCs and generate manganese dioxide precipitation in the subsurface (Chen et al. 2016). Permanganate is relatively stable in the subsurface, which makes it easier to deliver compared to other oxidants. Activated persulfate generates oxygen-free radicals to oxidize COCs. Free radicals can oxidize a wide variety of compounds, but are non-selective, and have extremely short lifetimes. Effectively delivering free radical-generating oxidants into the affected zones and ensuring contact with COCs can be difficult. Additionally, proprietary oxygen-release compounds can be injected to oxidize COCs and promote bioremediation of COCs.

Degradation of R99 diesel using ISCO has not been proven and optimized; R99 diesel might not undergo degradation in the same way that petroleum diesel degrades. As such, a treatability study to understand how R99 diesel might degrade would be necessary before deeming such a technology effective.

#### 6.4.4.2 In-Situ Thermal Desorption

ISTD is a thermally enhanced in-situ treatment technology that uses conductive heating elements to directly apply heat to impacted media. With ISTD, soil can be heated in-situ to a temperature as high as 1,000 degrees Fahrenheit to vaporize compounds with relatively high boiling points. ISTD involves simultaneous application of heat and vacuum (to remove vaporized compounds from the subsurface) to treat subsurface soils. The ISTD process consists of three steps: application of heat to contaminated media; collection of vaporized compounds through vapor extraction, followed by: treatment of the extracted vapors.

#### 6.4.4.3 Surfactant Injection with Groundwater Extraction and Treatment

Surfactant Injection with Groundwater Extraction and Treatment is a technology designed to enhance the efficiency of contaminant recovery. An amendment consisting of surfactant solution typically is injected across the entire LNAPL plume followed by groundwater extraction and treatment.

#### 6.4.4.4 Effectiveness

**In-Situ Chemical Oxidation**

Delivery of the oxidants to required locations is the key element for this approach's success. ISCO depends on achieving adequate contact between the injected oxidants and COCs in groundwater. Because chemical oxidation reactions occur rapidly, the diffusion and mass transfer rate of Site-related COCs away from the injection locations is expected to limit effectiveness. Poor application could result in large pockets of untreated Site-related COCs. Natural organics and reduced metals also consume oxidants. To treat Site-related COCs effectively, sufficient oxidant would need to be injected across the Site. As mentioned above, degradation of R99 diesel using ISCO has not been proven, and a treatability study to understand how R99 diesel might degrade would be necessary before deeming such a technology effective. ISCO typically is implemented when no or very little LNAPL is present. As such, ISCO is not recommended while LNAPL remains on groundwater.

**In-Situ Thermal Desorption**

ISTD would not be an effective treatment technology for the Site because it would not be viable given the Site constraints of the limited vadose zone above the shallow groundwater, proximity to ongoing businesses and receptors that may be impacted by volatilization of the R99 diesel, and proximity to marine receptors that may be impacted by volatilization of the R99 diesel.

**Surfactant Injection with Groundwater Extraction and Treatment**

Surfactant Injection with Groundwater Extraction and Treatment would be complicated by the tides and the proximity of the R99 diesel plume to open water, making this option not effective.

#### 6.4.4.5 Implementability

**In-Situ Chemical Oxidation**

ISCO is implementable at the Site for plume treatment because of the depth and limited volume of impacted groundwater that needs to be treated. This technology may have some limitations based on the continued presence of LNAPL, which would consume much of the ISCO products.

**In-Situ Thermal Desorption**
ISTD is not implementable at the Site because of the proximity to open water, tidal action that would impact ISTD, and the small size of the vadose zone, (less than 10 feet in depth). Effective vapor recovery would be technologically and economically problematic.

**Surfactant Injection with Groundwater Extraction and Treatment**
Surfactant Injection with Groundwater Extraction and Treatment is not implementable because of the tides and the proximity of the R99 diesel plume to open water, making this option not effective.

#### 6.4.4.6 Relative Cost

**In-Situ Chemical Oxidation**
ISCO has high to very high capital costs and moderate O&M costs. Overall, ISCO has a high relative cost. ISCO would require temporary closure of the parking area and the pier to automobile traffic during injection events, which typically require 2 to 4 days. A preliminary feasibility study cost estimate for this alternative is approximately $4,100,000, which may be higher due to the presence of LNAPL at the Site.

**In-Situ Thermal Desorption**
ISTD technology has very high relative costs, further complicated by the need for air emission controls.

**Surfactant Injection with Groundwater Extraction and Treatment**
Surfactant Injection with Groundwater Extraction and Treatment has very high relative costs, in addition to its difficulty in implementation (if possible at the Site), and the need for air emission controls.

#### 6.4.4.7 Screening Results

**In-Situ Chemical Oxidation**
ISCO was retained for detailed evaluation.

**In-Situ Thermal Desorption**
ISTD is not implementable and was not retained for detailed evaluation.

**Surfactant Injection with Groundwater Extraction and Treatment**
Surfactant Injection with Groundwater Extraction and Treatment is not implementable and was not retained for detailed evaluation.

### 6.4.5 Monitored Natural Attenuation

MNA is a technology that remediates groundwater through natural processes (e.g., biodegradation, dispersion, adsorption, etc.) without active intervention. Generally, groundwater monitoring is used to track the progress of remediation and to gain appreciation of the remedial progression. The technology is usually applied at properties where dissolved-phase concentrations are conducive to natural biodegradation and LNAPL levels are minimal.

#### 6.4.5.1 Effectiveness

MNA may an effective treatment technology. Its effectiveness would need to be established by collecting groundwater samples for parameters indicative of natural attenuation.

#### 6.4.5.2 Implementability

MNA is implementable at the Site pending confirmation that it is effective. There is already groundwater monitoring infrastructure in place.

#### 6.4.5.3 Relative Cost

MNA has moderate to high relative cost. Assuming a pilot study to confirm MNA is occurring, active product recovery for 3 years, and subsequent groundwater monitoring for 12 additional years (15 years total), costs are estimated to be approximately $1,600,000 as shown on Table 3.

#### 6.4.5.4 Screening Results

MNA is a technology that may be applied and could be effective at the Site. Therefore, MNA is retained for detailed evaluation.

### 6.4.6 Physical Barrier

A physical barrier such as a slurry wall or sheet pile wall can prevent migration of LNAPL. Such a barrier may provide additional protection to prevent R99 diesel releases from the land portion of the Site into open water. A slurry wall could be constructed by digging a sufficiently wide and deep trench, and backfilling it with an impermeable material such as a cement slurry to prevent movement of impacted water. Alternatively, a sheet pile wall can be installed without the need for wide trenching.

#### 6.4.6.1 Effectiveness

A physical barrier is an effective treatment technology that has been demonstrated to be effective on similar types of plumes in preventing migration of LNAPL outside of the containment area.

#### 6.4.6.2 Implementability

A physical barrier is not implementable. The presence of a utility corridor that includes sewer lines, storm drains, electrical, natural gas, and likely other lines is present in the area where the barrier wall would be installed. It is practically and logistically unfeasible to install an effective barrier wall at such a location. Installation of such a barrier will also be complicated by the presence of rip-rap and debris in soil.

#### 6.4.6.3 Relative Cost

A physical barrier would have a very high relative cost, even with no utilities that need significant rerouting.

#### 6.4.6.4 Screening Results

A physical barrier is not considered effective as it is not implementable. It was not retained for further evaluation because it is not appropriate for the physical and logistical circumstances at the Site.

# 7.0 PREFERRED REMEDIAL ACTION ALTERNATIVE

Based on the results from analysis of the alternatives using NCP criteria and criteria described in Resolution 92-49, no single remedial technology would achieve the desired remedial action objectives either because of technological limitations, implementation limitations, or cost limitations. Consequently, the selected RAA is a combination of limited excavation of the area of greatest historical LNAPL thickness, followed by a period of testing and observation to document the occurrence of MNA. Because of the numerous Site constraints, a single remedial action was not viewed as effective. Smaller, targeted actions were viewed as having the greatest chance for success in reducing the mass of R99 diesel in LNAPL, soil, and groundwater, and in reducing the amount of R99 diesel released into open water. Given these considerations, the interests of the people of the State are best served by this selected remedy as set forth in this FS/RAP.

## 7.1 RAOS

The above remedial RAA combination was selected because it meets the RAOs, is consistent with the NCP and Resolution 92-49, requires less planning time, and can be implemented more quickly than an alternative such as full Site excavation. The selected RAA combination will meet the RAOs and address the potential pathways.

## 7.2 NATIONAL CONTINGENCY PLAN CRITERIA

The combination of excavation and MNA fulfills the NCP criteria established for the Site as follows:

- It provides for the overall protection of human health and the environment.
- It achieves compliance with the ARARs.
- It complies with long-term effectiveness and permanence requirements. The selected RAA is an effective long-term and permanent solution, and would result in reduced concentrations of R99 diesel over time through impacted soil removal and degradation using MNA.
- It allows for the reduction of toxicity, mobility, or volume of R99 diesel.
- It has short-term effectiveness.
- It can be implemented.
- It will be more protective of human health and the environment than the No Action Alternative, although more costly to implement.
- The State of California has accepted similar RAAs followed by administrative controls and monitored natural attenuation at many sites throughout California.
- Community acceptance of the RAA is expected, as it will not inconvenience the community to the extent other alternatives would.

## 7.3 BUDGETARY COST ESTIMATE

The preliminary budgetary cost estimate to complete the work described based on the totals presented above is approximately $3,100,000 as presented in Table 4 (a summation of the tasks outlined in Tables 2 through 3). This estimate is a budgetary cost based on experience at other sites and anticipated engineering estimates; it is not an offer of services, but rather an indication of the order of magnitude costs that may be involved. Additionally, the FS/RAP requires approval from the regulator, and may require modifications based on feedback from various stakeholders.

Upon receipt of approval of the FS/RAP and incorporation of any required modifications, a bid package should be prepared to provide a more-accurate indication of remedial costs.

# 8.0 REMEDIAL ACTION PLAN

This section describes various components of the remedial action plan for the Site, taking into consideration the information summarized in the previous sections, the RAOs for R99 diesel, and the practicality of implementing remedial actions at the Site.

## 8.1 PUBLIC PARTICIPATION

The public participation requirements for this FS/RAP process consist of the following:

- Publishing a notice in a local newspaper informing the public of a 30-day public comment period to review and comment on the FS/RAP;
- Sending a fact sheet to the parties on the Site mailing list describing the proposed remedial action; and
- Making the FS/RAP available at the Water Board office and on the Water Board's publicly accessible GeoTracker database.

Farallon will work with the Water Board to support the public participation process.

A draft fact sheet that provides a description of the Site, including its history, known discharges of waste, Site investigation and cleanup activities to date, and a description of the proposed/planned Site investigation and cleanup activities, will be prepared. The draft fact sheet will include an illustrative map of the Site and subsurface plumes, and details of surrounding areas, contact information for the responsible party/parties (or designated consultants), the Water Board project manager, and the Water Board public participation specialist.

## 8.2 PERMITTING AND NOTIFICATIONS

Implementation of the selected remedial activities will require coordination with area tenants, and may require permits from various agencies, including an Encroachment Permit, amending the existing License Agreements between Pilot Thomas and the Port, building permits from the City of San Francisco, permits from BCDC, permits from the Air Pollution Control District, and permits from the Water Board. Additional permits beyond those described above will be obtained as necessary.

Farallon requests that the Water Board confirm that the remedial work described is exempt from CEQA.

Farallon understands that the proposed work may be disruptive to the area and area tenants, and will work cooperatively with stakeholders to provide necessary notices, and to endeavor to limit the extent and duration of potentially disruptive work.

## 8.3 TECHNICAL DESIGN OF CONSTRUCTION FEATURES

The following general steps will be required for the proper design and permitting of the excavation area:

- Geotechnical Evaluation – This evaluation will be conducted to confirm soil properties and groundwater conditions related to design and installation of a temporary containment wall/barrier to facilitate excavation. Location-specific information of the distribution, vertical and lateral, extent of the fine-grained material (i.e., bay mud) will be needed for consideration of design depths and feasibility.
- Hydrogeologic Analysis – A pump/aquifer test will be conducted to better understand the hydrogeology in the proposed excavation. Data from this test will be useful in evaluating the potential quantity of groundwater inflow into the excavation and, if required, the estimated volume of water requiring treatment. If LNAPL is present, this additional complication will need to be taken into consideration.
- Geophysical Utility Survey – Numerous utilities have been identified in and around the area of the excavation. Having a thorough understanding and layout of the utilities will greatly influence the design of the temporary containment wall/barrier that will surround the excavation area.

## 8.4 SOIL EXCAVATION

Farallon will excavate the area along the fuel pipeline of the inferred R99 diesel release. This work will include obtaining the necessary permits and notifications, preparing the area for excavation (e.g., closing the area to the public, removing existing fences, installing perimeter construction fencing). Groundwater monitoring wells that may be in the excavation area will be permitted for abandonment, and abandoned by removal during the excavation activities. Water storage tanks will be placed on the Site to accept groundwater that likely will be encountered during the excavation, as the excavation will extend into and below the top of groundwater.

Once the area has been prepared, Farallon will excavate the area shown on Figure 6 to a total depth of approximately 12 feet bgs. This depth was selected to allow for removal of soil above groundwater, soil in the groundwater smear zone (where the water vacillates between high- and low-tide ranges), and soil below the smear zone as a precautionary measure. This depth will necessitate dewatering during high tides. Attempts will be made to time the work to correspond with lower tides to the extent possible, to limit the volume of water removed from the excavation.

The fuel pipeline is anticipated to be encountered in the excavation at a depth of approximately 3 to 4 feet bgs. The pipeline will be cut and capped on the ends where it enters and exits the excavation. Parts of the pipeline not in the excavation will be left in-place rather than being removed. Farallon understands that there may be a desire on the part of the responsible parties to conduct forensic evaluations of the pipeline; however, such an activity, special handling, or excavations around the pipeline are not part of the proposed remedial work. Consequently, if forensic evaluations were to take place, Farallon would provide reasonable access during the excavation process, but would not be responsible for any incidental damages that may result from its excavation and removal of the pipeline and surrounding soil.

The volume of excavated soil is anticipated to be approximately 2,000 cubic yards.[5] The extent of excavation will be determined in the field and will be made to maximize the volume of impacted soil that can be removed while protecting and preventing damage to existing structures in the area. Soil will be excavated as planned and, in order to remove saturated soil below the groundwater level, the excavation will likely require shoring on all sides to prevent wall failure or collapse. Water storage tanks will be placed on the Site to accept groundwater that likely will be encountered during excavation, as the excavation will extend into and below the top of groundwater.

The excavation dewatering technique selected for remedial soil excavation will be dependent on the hydrological analysis discussed in Section 8.3. It is assumed that perimeter dewatering wells will be installed within the footprint of the excavation, however the layout and design of those wells have not yet been determined. If the hydrological analysis indicates that groundwater inflow to the excavation can be limited using sheet piles keyed into an impermeable soil layer, sufficient dewatering may be achieved through fewer wells or with a series of sump pumps.

Groundwater removed from the excavation through dewatering will either be containerized and removed from the Site for disposal, or treated on-Site and discharged to the San Francisco Bay under a National Pollutant Discharge Elimination System (NPDES) discharge permit obtained through the Water Board. If on-Site treatment is required, the treatment system design will be approved by the Water Board prior to implementation. It is assumed that groundwater removed from the excavation will be pumped to settling tanks for temporary storage and to separate sediments. The assumed treatment process will also include an oil-water separator to remove LNAPL, followed by granular activated carbon tanks, organoclay tanks, and a holding tank with an optional return line to the settling tanks. Treated groundwater will not be discharged until confirmation samples indicate that the water quality meets the discharge requirements. The groundwater treatment system will be regularly monitored as required by the Water Board. While collecting samples from the excavation sidewalls will not be possible due to the shoring required to safely conduct the excavation, soil samples from the excavation bottom will be collected and analyzed to document soil conditions on the excavation floor remaining in place after excavation.

Soil will be directly loaded onto end dump vehicles. Soil and groundwater removed during the excavation will be characterized and transported off the Site to an appropriate disposal facility. Following the removal of soil and before backfilling the excavation, approximately 2,400 pounds

[5] Volume calculated as: 3,000-square-foot area to be excavated x 12-foot depth x 1.5 fluff factor.

of PetroFix[6] will be placed in the excavation to further enhance remediation of the R99 diesel in the inferred release area.

Following completion of the excavation and placement of the PetroFix activated carbon, Farallon will backfill the area. Farallon might use self-compacting crushed rock as part of the backfill to alleviate any backfill compaction issues, given the Site's shallow groundwater, and to alleviate the possibility of hydraulic pumping of backfilled materials. Once the excavation has been backfilled, the surface area will be restored with asphalt and concrete paving to match pre-excavation conditions. Any fences removed will be restored at that time, and the parking area will be re-opened for use.

## 8.5 MONITORED NATURAL ATTENUATION

Following removal of residual LNAPL and R99 diesel in soil through excavation activities discussed above, MNA of groundwater holds significant promise for reducing Site-related COC concentrations in groundwater without pumping it to the surface for treatment and allowing natural processes to reduce R99 diesel without the addition of chemicals to modify groundwater chemistry. Site conditions do pose questions related to the effectiveness of MNA, notably tidal action, which significantly changes groundwater flow direction twice daily, and groundwater salinity.

Farallon will conduct groundwater analysis to confirm the suitability of MNA at the Site. If groundwater study results do not support MNA as a viable alternative, other alternatives (e.g., ISCO) may be evaluated.

## 8.6 SITE MANAGEMENT AND LNAPL RECOVERY AND MONITORING PLAN

A post-field activity Site management and LNAPL recovery and monitoring plan is included in Appendix A. Components of remediation monitoring are described in the following sections.

### 8.6.1 Booming Activities

Booming will continue three times per week to ensure that fuel releases are contained. Once sheens are no longer observed in the boomed areas, the frequency of boom inspections will be decreased to twice per week for 1 month, and once per week thereafter. The frequency of boom inspections may be decreased further upon concurrence from the Water Board.

[6] PetroFix removes hydrocarbons from the dissolved phase by adsorbing them on to activated carbon particles and then stimulates hydrocarbon biodegradation by adding electron acceptors. PetroFix is a concentrated water-based suspension consisting of micron-scale activated carbon and biostimulating electron acceptors. The formulation of micron-scale activated carbon (1 to 2 microns) is combined with both slow- and quick-release inorganic electron acceptors.

### 8.6.2 LNAPL Recovery

Residual LNAPL recovery will continue once per week to facilitate decreasing R99 diesel mass. Recovery will involve the combined use of the existing LNAPL recovery system as appropriate, use of a peristaltic pump to pump out wells that are not part of the LNAPL recovery system, and use of oleophilic absorbents. The frequency of LNAPL recovery may be modified depending on the presence of LNAPL observed and upon concurrence from the Water Board. Subject to modifications in the field during the remedial work, the proposed locations of LNAPL recovery and groundwater monitoring wells are included on Figure 6.

### 8.6.3 Groundwater and LNAPL Monitoring

Following completion of the excavation, groundwater will be monitored quarterly for at least the first 3 years or as required by permit (whichever is more frequent) to ensure that LNAPL thicknesses and detected dissolved R99 diesel continue to be reduced over time. As discussed above, residual LNAPL will be removed from wells with measurable thicknesses of LNAPL. Volumes of LNAPL removed will be noted and quantified. Subject to modifications in the field during the remedial work, the proposed locations of LNAPL recovery and groundwater monitoring wells are included on Figure 6.

Site-wide groundwater monitoring will be conducted quarterly and will involve collecting groundwater samples from all wells that do not have detectable LNAPL, and analyzing the samples for TPHd, TPHmo, and VOCs. Results from the groundwater monitoring will be submitted to the Water Board quarterly.

## 8.7 SCOPE CHANGES AND SITE CLOSURE

As remediation is accomplished, Farallon will work with the Water Board to keep it abreast of progress. Once the RAO has been reached, Farallon will work with the Water Board to prepare the Site for closure. If RAOs are not being achieved and remedial efforts require modification or changes, Farallon will work collaboratively with the Water Board to determine suitable changes.

# 9.0 SCHEDULE

The anticipated schedule to implement the selected remedy is presented below. It is important to note that dates presented below may need to be modified to accommodate conditions outside of the control of the parties conducting the remediation.

| Activity | Commence | Complete | Ongoing Activities |
|---|---|---|---|
| Finalize FS/RAP | Q1 2023 | Q3 2023:<br>2 months for Water Board approval;<br>1 month to reply to comments (if any) | LNAPL recovery, boom operations, maintenance, reporting |
| Public Participation | Q2 2023 | Q3 2023 | Response to public comments as needed<br>LNAPL recovery, boom operations, maintenance, reporting |
| Permitting and Notifications | Q3 2023 | Q4 2023 | Response to permitting requirements as needed<br>LNAPL recovery, boom operations, maintenance, reporting |
| Soil Excavation | Q4 2023 | Q1 2024 | LNAPL recovery, boom operations, maintenance, reporting |
| MNA Study | Q2 2024 | Q3 2024 | LNAPL recovery, boom operations, maintenance, reporting |
| Remediation Monitoring and Reporting | Q3 2023 | Late Q4 2038 | LNAPL recovery, boom operations, maintenance, monitoring and reporting as required |

# 10.0 BIBLIOGRAPHY


Acton Mickelson Environmental, Inc. 2009. *Updated Remedial Action Plan, GP Resources Marine Diesel Bulk Storage Facility, Former Mobil Bulk Terminal #04-394, 440 Jefferson Street, San Francisco, California.* Prepared for ExxonMobil Oil Corporation. January 15.

———. 2012. *Corrective Action for Seep and Sheen Summary Report, GP Resources Marine Diesel Bulk Storage Facility, Former Mobil Bulk Terminal #04-394, 440 Jefferson Street, San Francisco, California*. Prepared for ExxonMobil Oil Corporation. April 18.

———. 2015. *Risk Management Plan, GP Resources Marine Diesel Bulk Storage Facility, Former Mobil Bulk Terminal #04-394, 440 Jefferson Street, San Francisco, California*. Prepared for ExxonMobil Oil Corporation. October 23.

California State Water Resources Control Board. 2022. GeoTracker Public Water Wells Database. <https://geotracker.waterboards.ca.gov/map/?CMD=runreport&myaddress=public+wells>. (January 22, 2022.)

California State Water Resources Control Board. 1996. *Policies and Procedures for Investigation and Cleanup and Abatement of Discharges under Water Code Section 13304*. Resolution No. 92-49. Amended on April 21, 1994 and October 2, 1996. October 2.

———. 2012. *Low-Threat Underground Storage Tank Case Closure Policy*. November 6.

CDIM Engineering (CDIM). 2020a. *Work Plan, Hyde Street Harbor Hydrocarbon Seep*. September 21.

———. 2020b. *Sampling and Analysis Plan, Hyde Street Harbor Hydrocarbon Seep*. December 11. Rev 1.

———. 2021a. Memorandum Regarding Field Activity Summary: Hyde Street Harbor Hydrocarbon Seep. From Scott Bourne and Mary Cunningham. To Shannon Alford, Port of San Francisco. March 5.

———. 2021b. *Data Summary Report, Hyde Street Harbor Hydrocarbon Seep Investigation, Latitude: 37.808364, Longitude: -122.420292*. Prepared for U.S. Environmental Protection Agency, Region IX. May 6.

Chen, Ku-Fan, Yu-Chen Chang, and Wan-Ting Chiou. 2016. "Remediation of diesel-contaminated soil using *in situ* chemical oxidation (ISCO) and the effects of common oxidants on the indigenous microbial community: a comparison study." *Journal of Chemical Technology & Biotechnology* 91: 1877–1888.

CGRS, Inc. 2021. *Secondary Containment Testing Report Form*. Facility Name: Maxum Petroleum Fuel Dock, 2950 Hyde Street. April 26.

ERM-West, Inc (ERM). 2021. *Hyde Street Harbor Facility Work Plan, Near Intersection of Hyde and Jefferson Streets, San Francisco, California*. Prepared for Maxum Petroleum, Inc. March 25.

Farallon Consulting, LLC. 2021a. Technical Memorandum Regarding Updated Work Plan Addendum, Hyde Street Study Area, 2950 Hyde Street, San Francisco, California. From Peter Jewett, Farallon. To Chris Reiner and Amanda Pease, U.S. Environmental Protection Agency. June 15.

———. 2021b. Technical Memorandum Regarding Work Plan Second Addendum, Hyde Street Study Area, 2950 Hyde Street, San Francisco, California. From Peter D. Jewett and Martin E. Hamann, Farallon. To Chris Reiner and Amanda Pease, U.S. Environmental Protection Agency. August 4.

———. 2022a. *Site Investigation Report, Hyde Street Study Area, 2950 Hyde Street, San Francisco, California*. Prepared for Pilot Thomas Logistics LLC (formerly Maxum Petroleum, Inc.). February 8.

———. 2022b. Technical Memorandum Regarding Second Revised Draft LNAPL Recovery Pilot Study Summary, Hyde Street Study Area, 2950 Hyde Street, San Francisco, California. From Peter D. Jewett, Martin E. Hamann, and Matt Nusenow, Farallon. To Chris Reiner and Amanda Pease, U.S. Environmental Protection Agency. February 16.

———. 2023a. *Interim Vapor Intrusion Evaluation Report, Hyde Street Study Area, 2950 Hyde Street, San Francisco, California*. March 27.

———. 2023b. *Interim Vapor Intrusion Evaluation Report, Hyde Street Study Area, 2950 Hyde Street, San Francisco, California*. Pending.

Interstate Technology Regulatory Council. 2022. Appendix E – LNAPL Sheens Appendix of *Light Non-Aqueous Phase Liquid Site Management: LCSM Evolution, Decision Process, and Remedial Technologies (LNAPL-3)*. <https://lnapl-3.itrcweb.org/appendix-e-lnapl-sheens-appendix/>. (November 30, 2022.

San Francisco Bay Regional Water Quality Control Board (Water Board). 2019a. *San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan).* November 5.

———. 2019b. *Environmental Screening Levels.* Rev 2.

———. 2022. *Water Quality Control Plan (Basin Plan) for the San Francisco Bay Basin.* <https://www.waterboards.ca.gov/sanfranciscobay/basin_planning.html.> (November 30, 2022.)

U.S. Environmental Protection Agency (EPA). 1988a. *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*. Interim Final. EPA Publication EPA/540/G-89/004. October.

———. 1988b. *Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites*. Interim Final. EPA Publication EPA/540/G-88/003. December.

———. 1999. *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites*. OSWER Directive 9200.4-17P. April 21.

———. 2001. *Using The Triad Approach to Improve the Cost-Effectiveness of Hazardous Waste Site Cleanups*. EPA Publication EPA 542-R-01-016. October.

———. 2011. *An Approach for Evaluating the Progress of Natural Attenuation in Groundwater.* EPA Publication EPA 600/R-11/204. December.

———. 2022. Letter Regarding EPA's Clean Water Act Section 311 Order to Maxum Petroleum, Inc. and Pilot Thomas Logistics, LLC; U.S. EPA Docket No. CWA-09-2021-0001. From Christopher Reiner. To Rene I. Gamboa, Lewis Brisbois. July 27.

# FIGURES

FEASIBILITY STUDY AND REMEDIAL ACTION PLAN
Hyde Street Harbor Facility
2950 Hyde Street
San Francisco, California

Farallon PN: 2609-001


REFERENCE: 7.5 MINUTE USGS QUADRANGLE SAN FRANCISCO NORTH, CALIFORNIA, DATED 2013


N

0 3,000

SCALE IN FEET

FARALLON CONSULTING

Your Challenges. Our Priority. | farallonconsulting.com

Washington
Issaquah | Bellingham | Seattle

Oregon
Portland | Baker City

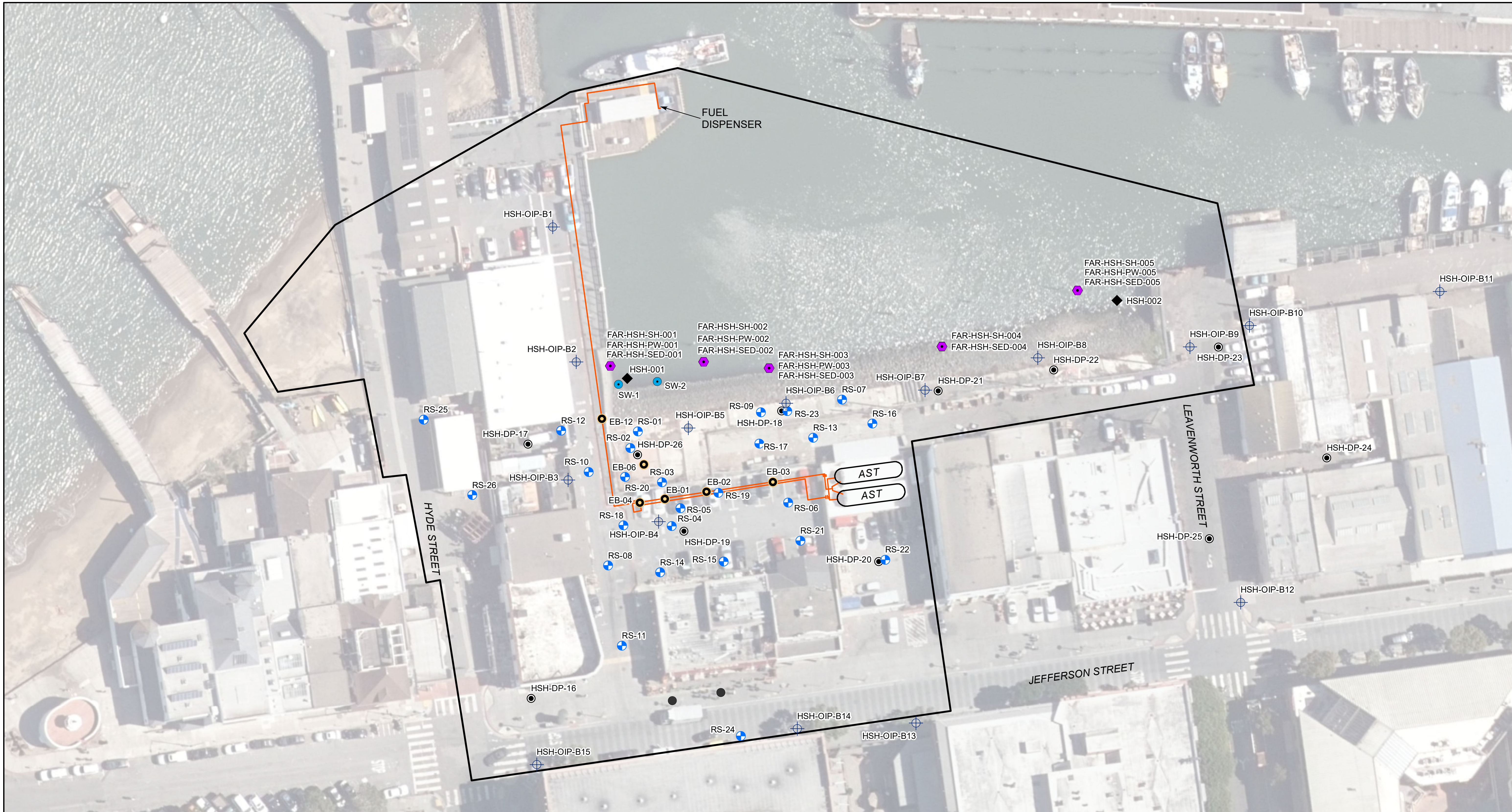
California
Oakland | Irvine

# FIGURE 1

SITE VICINITY MAP
HYDE STREET STUDY AREA
SAN FRANCISCO, CALIFORNIA

FARALLON PN: 2609-001

Drawn By: chartman | Checked By: MH | Date: 12/9/2022 | Disc Reference:
Q:\Projects\2609 Maxum Petroleum\001 Hyde St Harbor Facility\Mapfiles\027\Figure-01_SiteVicinityMap_CA.mxd




## LEGEND

- OPTICAL IMAGE PROFILER/HYDRAULIC PROFILING TOOL LOCATION (JANUARY 2021)
- ATTEMPTED BORING FOR GROUNDWATER MONITORING WELL INSTALLATION
- EXISTING MONITORING WELL
- SEDIMENT, PRODUCT, AND POREWATER SAMPLE LOCATION (JUNE 2021)
- DIRECT PUSH BORING LOCATION (FEBRUARY 2021)
- SURFACE WATER SAMPLE (ERM)
- EXPLORATORY BORING (ERM)
- SEEP SAMPLING LOCATION
- 4" MAXUM/GENERAL PETROLEUM INLET DIESEL LINE
- HYDE STREET STUDY AREA

NOTES:
1. ALL LOCATIONS ARE APPROXIMATE.
2. FIGURES WERE PRODUCED IN COLOR. GRAYSCALE COPIES MAY NOT REPRODUCE ALL ORIGINAL INFORMATION.

N

0 60
SCALE IN FEET

FARALLON CONSULTING

Washington
Issaquah | Bellingham | Seattle

Oregon
Portland | Baker City

California
Oakland | Irvine

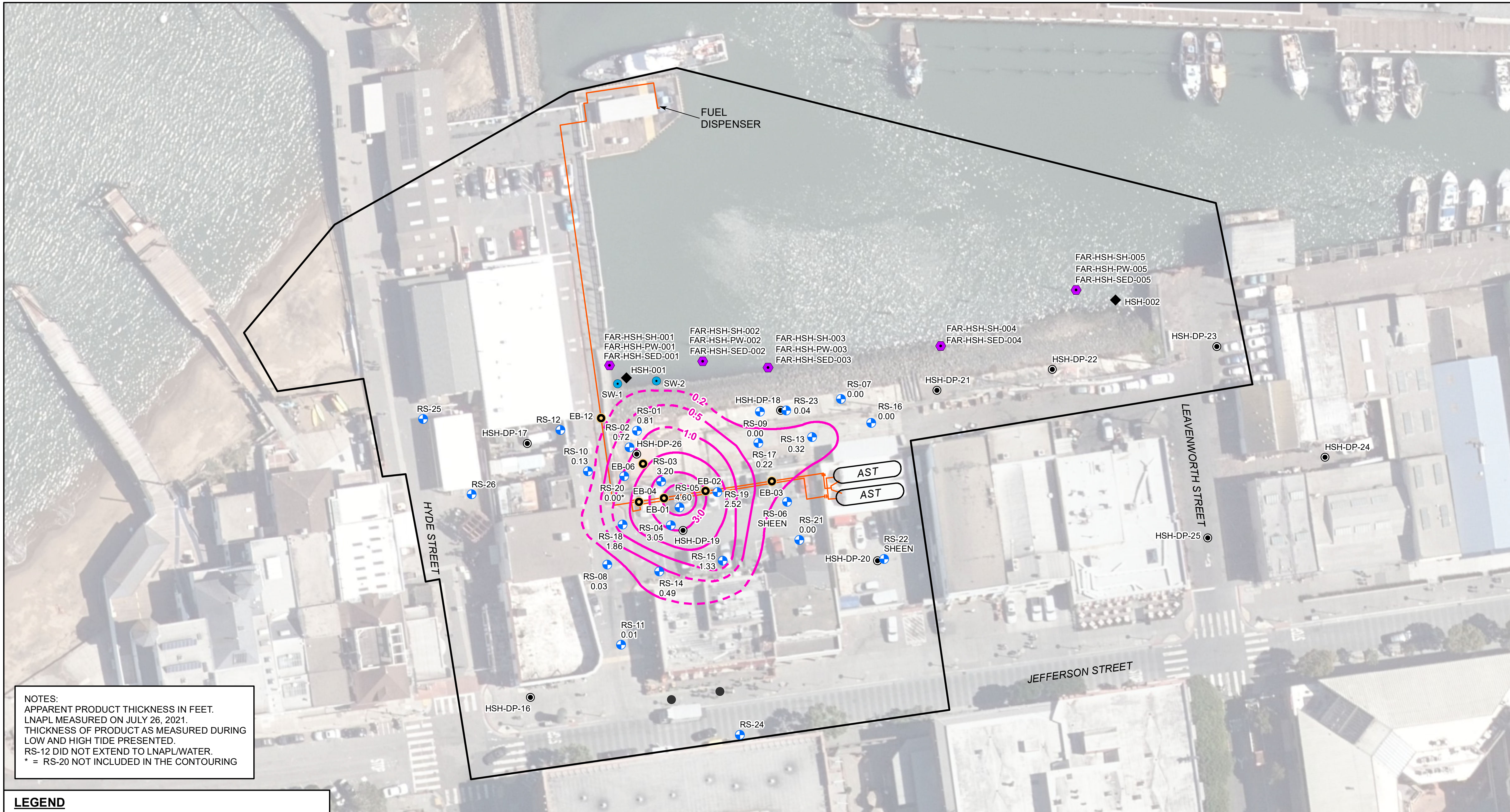
Your Challenges. Our Priority. | farallonconsulting.com

# FIGURE 2

SITE PLAN SHOWING SAMPLING, BORING, AND MONITORING WELL LOCATIONS
HYDE STREET STUDY AREA
SAN FRANCISCO, CALIFORNIA

FARALLON PN: 2609-001

Drawn By: chartman | Checked By: MH | Date: 12/9/2022 | Disc Reference:
Q:\Projects\2609 Maxum Petroleum\001 Hyde St Harbor Facility\Mapfiles\027\Figure-02_SitePlan.mxd




NOTES:
APPARENT PRODUCT THICKNESS IN FEET.
LNAPL MEASURED ON JULY 26, 2021.
THICKNESS OF PRODUCT AS MEASURED DURING LOW AND HIGH TIDE PRESENTED.
RS-12 DID NOT EXTEND TO LNAPL/WATER.
* = RS-20 NOT INCLUDED IN THE CONTOURING

## LEGEND

- ATTEMPTED BORING FOR GROUNDWATER MONITORING WELL
- EXISTING MONITORING WELL
- SEDIMENT, PRODUCT, AND POREWATER SAMPLE LOCATION (FARALLON)
- DIRECT PUSH BORING LOCATION (FEBRUARY 2021)
- SURFACE WATER SAMPLE (ERM)
- EXPLORATORY BORING (ERM)
- SEEP SAMPLING LOCATION
- 4" MAXUM/GENERAL PETROLEUM INLET DIESEL LINE
- LNAPL THICKNESS (DASHED WHERE INFERRED)
- HYDE STREET STUDY AREA
- 1.01 LIGHT NONAQUEOUS-PHASE LIQUID (LNAPL) THICKNESS (IN FEET)
- AST = ABOVEGROUND FUEL STORAGE TANK

N

0 60
SCALE IN FEET

NOTES:
1. ALL LOCATIONS ARE APPROXIMATE.
2. FIGURES WERE PRODUCED IN COLOR. GRAYSCALE COPIES MAY NOT REPRODUCE ALL ORIGINAL INFORMATION.

FARALLON CONSULTING
Your Challenges. Our Priority. | farallonconsulting.com

Washington
Issaquah | Bellingham | Seattle
Oregon
Portland | Baker City
California
Oakland | Irvine

# FIGURE 3

SITE PLAN SHOWING AREAL EXTENT AND THICKNESS OF SUBSURFACE LNAPL (JULY 2021)
HYDE STREET STUDY AREA
SAN FRANCISCO, CALIFORNIA

FARALLON PN: 2609-001

Drawn By: chartman | Checked By: MH | Date: 12/9/2022 | Disc Reference:
Q:\Projects\2609 Maxum Petroleum\001 Hyde St Harbor Facility\Mapfiles\027\Figure-03_SitePlan_LNAPL_July2021.mxd


**LEGEND**

- EXISTING MONITORING WELL
- SEEP SAMPLING LOCATION
- DIRECT PUSH BORING LOCATION (FEBRUARY 2021)
- 4" MAXUM/GENERAL PETROLEUM INLET DIESEL LINE
- LNAPL THICKNESS (DASHED WHERE INFERRED)
- HYDE STREET STUDY AREA

NOTES:
APPARENT LNAPL THICKNESS AVERAGED OVER DATA COLLECTED OCTOBER 4, 2022 THROUGH NOVEMBER 9, 2022

LNAPL MEASUREMENTS IN FEET

N

0 30
SCALE IN FEET

ALL LOCATIONS ARE APPROXIMATE.
FIGURES WERE PRODUCED IN COLOR.
GRAYSCALE COPIES MAY NOT REPRODUCE ALL ORIGINAL INFORMATION.

FARALLON CONSULTING
Washington
Issaquah | Bellingham | Seattle
Oregon
Portland | Baker City
California
Oakland | Irvine
Your Challenges. Our Priority. | farallonconsulting.com

# FIGURE 4
SITE PLAN SHOWING AREAL EXTENT AND THICKNESS OF SUBSURFACE LNAPL (OCTOBER/NOVEMBER 2022)
HYDE STREET STUDY AREA
SAN FRANCISCO, CALIFORNIA

FARALLON PN: 2609-001

Drawn By: chartman | Checked By: MH | Date: 12/9/2022 | Disc Reference:
Q:\Projects\2609 Maxum Petroleum\001 Hyde St Harbor Facility\Mapfiles\027\Figure-04_LNAPL_Thickness_OctNov2022.mxd


## LEGEND

- ATTEMPTED BORING FOR GROUNDWATER MONITORING WELL INSTALLATION
- EXISTING MONITORING WELL
- SEDIMENT, PRODUCT, AND POREWATER SAMPLE LOCATION (FARALLON)
- DIRECT PUSH BORING LOCATION (FEBRUARY 2021)
- SURFACE WATER SAMPLE (ERM)
- EXPLORATORY BORING (ERM)
- SEEP SAMPLING LOCATION
- SAMPLE WITH NO LNAPL OR INDICATION OF R99 DIESEL IN GROUNDWATER OR SOIL
- SAMPLE WITH INDICATION OF R99 DIESEL IN LNAP, GROUNDWATER OR SOIL
- INFERRED BOUNDARY INDICATING NO DISSOLVED R99 DIESEL IN GROUNDWATER
- 4" MAXUM/GENERAL PETROLEUM INLET DIESEL LINE
- HYDE STREET STUDY AREA

AST = ABOVEGROUND FUEL STORAGE TANK

NOTES:
1. ALL LOCATIONS ARE APPROXIMATE.
2. FIGURES WERE PRODUCED IN COLOR. GRAYSCALE COPIES MAY NOT REPRODUCE ALL ORIGINAL INFORMATION.
3. LNAPL = LIGHT NONAQUEOUS-PHASE LIQUID

N

0 60
SCALE IN FEET

FARALLON CONSULTING
Your Challenges. Our Priority. | farallonconsulting.com

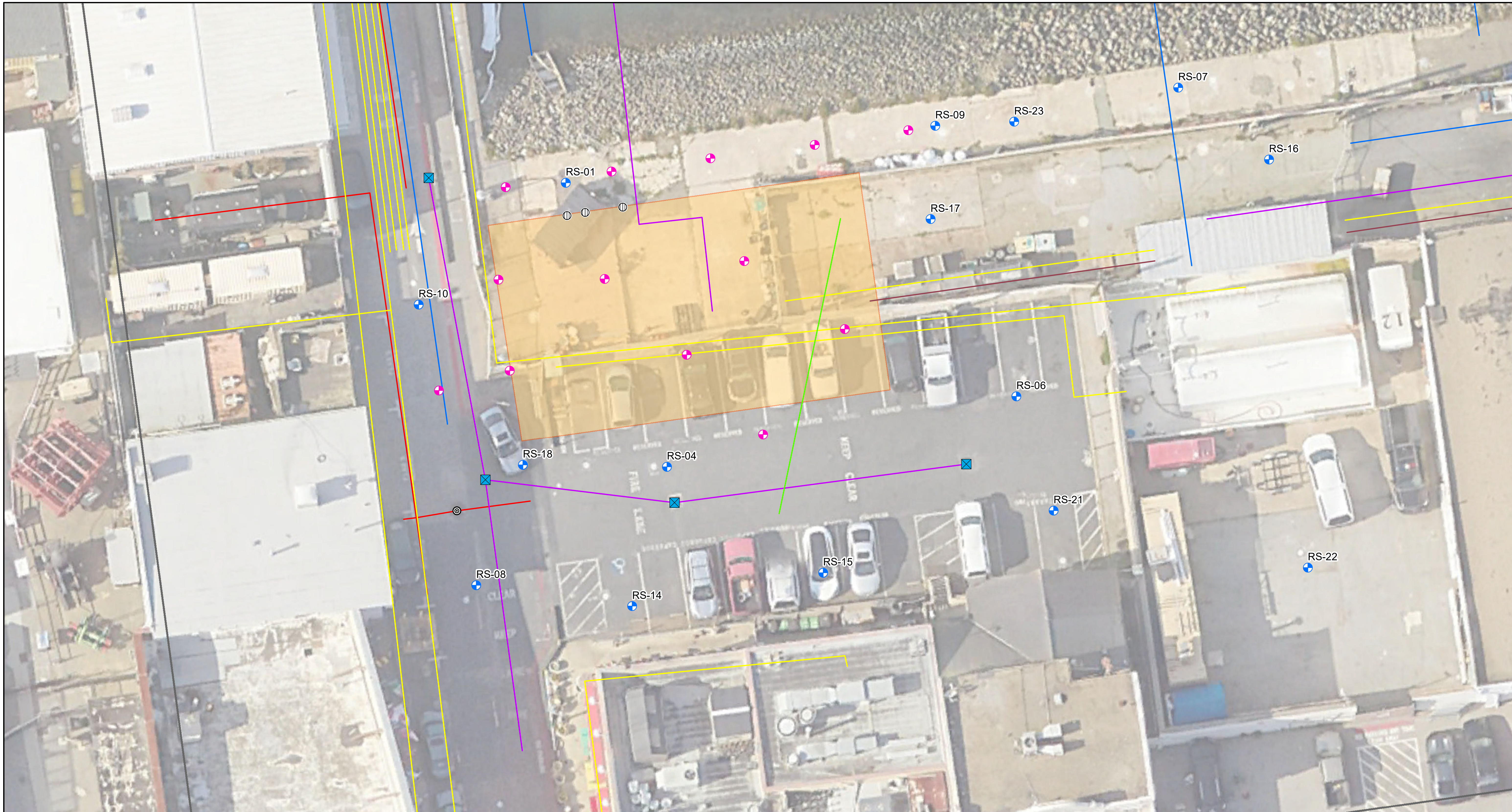
Washington
Issaquah | Bellingham | Seattle
Oregon
Portland | Baker City
California
Oakland | Irvine

# FIGURE 5

SITE PLAN SHOWING EXTENT OF DISSOLVED-PHASE R99 DIESEL IN GROUNDWATER
HYDE STREET STUDY AREA
SAN FRANCISCO, CALIFORNIA

FARALLON PN: 2609-001

Drawn By: chartman | Checked By: MH | Date: 12/9/2022 | Disc Reference:
Q:\Projects\2609 Maxum Petroleum\001 Hyde St Harbor Facility\Mapfiles\027\Figure-05_Extent_GW_R99Diesel.mxd




**LEGEND**

- PROPOSED GROUNDWATER MONITORING WELL/ LNAPL RECOVERY WELL
- EXISTING MONITORING WELL/LNAPL RECOVERY WELL
- CATCH BASIN
- DRAIN INLET
- MANHOLE
- ELECTRICAL
- GAS
- SEWER
- STORMWATER
- TELEPHONE
- WATER
- APPROXIMATE AREA OF PLANNED EXCAVATION
- SAN FRANCISCO COUNTY PARCEL BOUNDARY

N

0 20

SCALE IN FEET

NOTES:
1. ALL LOCATIONS ARE APPROXIMATE.
2. FIGURES WERE PRODUCED IN COLOR. GRAYSCALE COPIES MAY NOT REPRODUCE ALL ORIGINAL INFORMATION.

FARALLON CONSULTING

Washington
Issaquah | Bellingham | Seattle

Oregon
Portland | Baker City

California
Oakland | Irvine

Your Challenges. Our Priority. | farallonconsulting.com

# FIGURE 6

## SITE MAP SHOWING REMEDIAL ACTIONS ACROSS THE SITE HYDE STREET STUDY AREA SAN FRANCISCO, CALIFORNIA

FARALLON PN: 2609-001

Drawn By: chartman    Checked By: MH    Date: 6/7/2023    Disc Reference:

Q:\Projects\2609 Maxum Petroleum\001 Hyde St Harbor Facility\Mapfiles\027\Figure-06_RemedialFeatures.mxd

# TABLES

FEASIBILITY STUDY AND REMEDIAL ACTION PLAN
Hyde Street Harbor Facility
2950 Hyde Street
San Francisco, California

Farallon PN: 2609-001

# Table 1
## Screening of General Response Technologies
## Hyde Street Study Area
## San Francisco, California
## Farallon PN:2609-001

| General Response Action | Remedial Response Type | Process Options/Example | Evaluation and Selection of Representative Technologies | | | Retained for Further Evaluation?* | Comments |
|---|---|---|---|---|---|---|---|
| | | | Effectiveness | Implementability | Costs | | |
| No Action | None | No Action | Not Effective | Implementable | Low | Yes | Retained for NCP baseline/comparison. |
| Full Soil Removal | Soil Removal | Mass excavation | Not Effective | Not implementable | High to Very High | No | Full soil removal neither feasible nor implementable due to Site constraints. |
| Partial Soil Removal | Soil Removal | Mass excavation/targeted excavation | Effective | Difficult to implement to implementable (if targeted) | High to Very High | Yes | Considered partially effective if limited/targeted excavation is performed. The need for limited/target excavation is foreseen due to Site constraints. |
| LNAPL/Groundwater Removal | LNAPL/Groundwater Removal | Groundwater pump and treat/extraction wells/collection trenches | Not effective | Difficult to implement - not implementable | High | No | Groundwater removal and treatment considered ineffective. Ongoing LNAPL product skimming is effective, and has been shown to reduce LNAPL thickness over time. |
| In-Situ Treatment | Chemical/Biological | Substrate injections to enhance biological remedial processes: in- situ chemical oxidation | Not effective | Implementable - not implementable | High | No | Not effective while LNAPL remains on groundwater. Range in implementability based on implementation area; complete implementation is not considered feasible. Treatability Study is needed to assess effectiveness. |
| | Thermal Desorption | Heating subsurface to mobilize and volatilize R99 diesel from soil and groundwater, to be captured in vapor | Not effective | Not implementable | Very High | No | Implementability reduced by air emission controls, tidal fluctuations, and relatively shallow vadose zone. |
| | Surfactant Injection with Groundwater Extraction and Treatment | Surfactant solution injected across entire LNAPL plume; groundwater recovered and treated | Not effective | Not implementable | Very High | No | Implementability reduced by air emission controls, tidal fluctuations, and relatively shallow vadose zone. |
| Monitored Natural Attenuation | Groundwater Degradation | Existing groundwater chemistry facilitates the natural degradation of fuels and component chemicals | Effective | Implementable | Moderate | Yes | MNA Treatability Study needed prior to full-scale implementation. |
| Physical Barrier | Contaminant Isolation | Installation of a physical barrier to prevent migration of R99 diesel-LNAPL, and impacted groundwater from reaching open water | Effective | Not implementable | High to Very High | No | Presence of utility corridor precludes implementation. |

<u>NOTES</u>:

LNAPL = light nonaqueous-phase liquid

NPL= National Oil and Hazardous Substance Pollution Contingency Plan

* None of the responses actions retained are viewed as being effective and implementable on their own. Rather a combination of response actions is viewed as necessary to achieve remedial goals.

# Table 2
## Preliminary Remediation Cost Estimate - Alternative: Partial Soil Remediation Using Excavation
## Hyde Street Study Area
## San Francisco, California
## PN: 2609-001

| | ITEM | QUANTITY | UNIT | COST | TOTAL COST | ASSUMPTION |
|---|---|---|---|---|---|---|
| **CONSTRUCTION ITEMS** | | | | | | |
| **I.** | **REMEDIATION ANALYSIS, DESIGN, and PERMITTING**<br>SOIL EXCAVATION REMEDIATION | | | | | |
| A. | Feasibility Study | 1 | LS | $ 10,000 | $ 10,000 | $10,000 is typical. Includes CSM, evaluation of remediation alternatives, remedy selection. |
| B. | Remedial Action Plan (Soil Remediation) | 1 | LS | $ 25,000 | $ 25,000 | Includes updated CSM; excavation, shoring, dewatering, and backfilling design elements; well plan; monitoring program. |
| C. | Bid Documents and Support | 1 | LS | $ 5,000 | $ 5,000 | Subcontractors, procurement, and planning. |
| D. | Permitting - Excavation | 1 | LS | $ 5,000 | $ 5,000 | Permits through City of San Francisco and Port of San Francisco. |
| E. | Permitting - Wells | 1 | LS | $ 5,000 | $ 5,000 | Permits through City of San Francisco and Port of San Francisco. |
| F. | Groundwater Model | 1 | LS | $ 50,000 | $ 50,000 | Groundwater Flow Study and model to assist with dewatering plans. |
| G. | Shoring Plan | 1 | LS | $ 25,000 | $ 25,000 | Excavation shoring design. |
| | | | | | | |
| | | | | **SUBTOTAL:** | **$ 125,000** | |
| **II.** | **REMEDIATION IMPLEMENTATION**<br>EXCAVATION | | | | | |
| A. | Well Removals | 8 | EA | $ 5,000 | $ 40,000 | Removal of 8 monitoring wells (3 days) within the excavation footprint. |
| B. | Soil Excavation | 1,333 | CY | $ 50 | $ 66,650 | Excavation is 3,000 square feet down to 12 feet below ground surface.<br>Soil is saturated and requires dewatering prior to loading for transport off the Site. |
| C. | Excavation Shoring | 1 | LS | $ 125,000 | $ 125,000 | Metal sheet shoring with I beam support. |
| D. | Excavation Dewatering | 2 | EA | $ 100,000 | $ 200,000 | Treatment system (oil-water separator, settling tank, sand filter, carbon filter) with two 20,000-gallon frac tanks.<br>Treating to 100 µg/l TPHd for discharge to storm sewer under NPDES permit. Monthly rental and operational costs. |
| E. | Soil Transport and Disposal | 2,666 | Ton | $ 75 | $ 199,950 | Soil disposed as nonhazardous soil at $45 per ton, with 2.0 tons per cubic yard. |
| F. | PetroFix Activated Carbon | 1 | LS | $ 45,000 | $ 45,000 | Spray coating on the entire 3,000 sf base of excavation; 2,400 lb of PetroFix |
| G. | Excavation Backfilling | 1 | LS | $ 77,000 | $ 77,000 | Geotextile Fabric with drain rock.<br>$20 per square-foot installation of geofabric and drain rock for two 1-foot lifts.<br>$15 per CY backfill above geotechnical lifts. |
| H. | Well Installations | 8 | EA | $ 6,000 | $ 48,000 | Reinstallation of 8 monitoring wells (4 days) within the excavation footprint. |
| I. | Remediation Oversight | 1 | LS | $ 72,000 | $ 72,000 | 8 weeks of oversight. |
| | | | | **SUBTOTAL:** | **$ 873,600** | |

# Table 2
## Preliminary Remediation Cost Estimate - Alternative: Partial Soil Remediation Using Excavation
## Hyde Street Study Area
## San Francisco, California
## PN: 2609-001

| | ITEM | QUANTITY | UNIT | COST | TOTAL COST | ASSUMPTION |
|---|---|---|---|---|---|---|
| **III.** | **ENVIRONMENTAL CONSULTING SERVICES DURING GROUNDWATER REMEDIATION** EXCAVATION | | | | | |
| A. | Data Analysis, Community Notifications, Access Management, Health and Safety | 1 | LS | $ 25,000 | $ 25,000 | |
| B. | Client Consultation | 1 | LS | $ 10,000 | $ 10,000 | Presence at kickoff meeting and conference calls. |
| C. | Agency Meetings | 6 | EA | $ 2,500 | $ 15,000 | Six meetings with regulatory agencies from pre-planning through completion of remediation work. |
| | | | | **SUBTOTAL:** | **$ 50,000** | |
| **IV.** | **WATER TREATMENT PERFORMANCE MONITORING AND COMPLIANCE REPORTING** | | | | | |
| A. | Groundwater Monitoring, Sampling, Testing, and Waste Management | 8 | Event | $ 6,000 | $ 48,000 | Weekly sampling of water treatment system for performance monitoring. |
| B. | Water Treatment System Report | 2 | Event | $ 7,500 | $ 15,000 | Monthly reports for 2 months. |
| | | | | **SUBTOTAL:** | **$ 63,000** | |
| **V.** | **REMEDIATION CLOSEOUT** | | | | | |
| A. | Remediation Completion Report | 1 | LS | $ 20,000 | $ 20,000 | |
| | | | | **SUBTOTAL:** | **$ 20,000** | |

# Table 2
## Preliminary Remediation Cost Estimate - Alternative: Partial Soil Remediation Using Excavation
## Hyde Street Study Area
## San Francisco, California
## PN: 2609-001

| ITEM | | QUANTITY | UNIT | COST | TOTAL COST | ASSUMPTION |
|---|---|---|---|---|---|---|
| **VI. IMPLEMENTATION OF INSTITUTIONAL CONTROLS (ICs)** | | | | | | |
| A. | Preparation of Deed Restriction, Legal Description, Notification Signage, and Outreach | 1 | LS | $ 30,000 | $ 30,000 | |
| | | | | **SUBTOTAL:** | **$ 30,000** | |
| | | | | | | |
| | | | | Total Capital Costs | $ 1,161,600 | |
| | | | | 30% Contingency | $ 348,480 | |
| | | | | **TOTAL:** | **$ 1,510,080** | |

**NOTES:**

1. This Preliminary Remediation Cost Estimate is only for a partial excavation of impacted Site materials and does not reflect a stand-alone or comprehensive remedial action.
2. This Preliminary Remediation Cost Estimate was prepared in consideration of the environmental data presented in the *Site Investigation Report, Hyde Street Study Area, 2950 Hyde Street, San Francisco, California dated* February 8, 2022 prepared for Pilot Thomas Logistics LLC (formerly Maxum Petroleum, Inc.) by Farallon Consulting, L.L.C.
3. This Preliminary Remediation Cost Estimate is an approximate cost of construction, and reflects available cost information for construction located in the San Francisco Bay Area, California.
4. This Preliminary Remediation Cost Estimate represents an opinion of the probable costs of construction, within a reasonable degree of certainty. This estimate does not guarantee the cost of labor, material, or equipment, nor the means, methods, or procedures of the Contractor's work as determined by the Contractor and/or Owner, nor the competitive bidding submissions.
5. This Preliminary Remediation Cost Estimate of probable construction cost is based on Farallon's experience and qualifications as an engineer, and shall be deemed to represent Farallon's opinion and judgment. This estimate cannot and does not guarantee that proposals, bids, or actual costs will be the same as or within any specific percentage of this estimate of probable construction cost.
6. This Preliminary Remediation Cost Estimate is an order-of-magnitude estimate, has been developed for the sole purpose of evaluating and comparing potential remedial action alternatives, is assumed to be accurate within -25% to +25%, and may require adjustment if new information becomes available.
7. Inherent in soil, foundations, groundwater, and other environmental investigations, actual conditions may vary materially from those noted at test points or sample intervals. Because of these inherent uncertainties, changed or unanticipated conditions may arise during construction activities at the project site subsequent to the initial investigation(s) that could potentially affect project scope and cost. Therefore, this estimate, with respect to potential construction costs, including environmental remediation costs, shall not be deemed a guaranteed maximum price or cost of the project.

CY = cubic yard
EA = each
LS = lump sum
µg/l = micrograms per liter
NPDES = National Pollutant Discharge Elimination System
Qtr = quarter
TPHd = total petroleum hydrocarbons as diesel

**ASSUMPTIONS/EXCLUSIONS:**

1. This estimate does not include General Contractor’s overhead, profit, and general conditions.
2. All unit prices shown in this estimate should be verified by a local Contractor.

# Table 3
# Preliminary Remediation Cost Estimate - Alternative: Groundwater Remediation Using Monitored Natural Attenuation
# Hyde Street Study Area
# San Francisco, California
# PN: 2609-001

| | ITEM | QUANTITY | UNIT | COST | TOTAL COST | ASSUMPTION |
|---|---|---|---|---|---|---|
| **CONSTRUCTION ITEMS** | | | | | | |
| **I.** | **REMEDIATION ANALYSIS, DESIGN & PERMITTING**<br>MONITORED NATURAL ATTENUATION GROUNDWATER REMEDIATION | | | | | |
| A. | Feasibility Study | 1 | LS | $ 7,500 | $ 7,500 | $7,500 is typical. Includes CSM, evaluation of remediation alternatives, and remedy selection. |
| B. | Remedial Action Plan (Full-Scale Groundwater Remediation) | 1 | LS | $ 25,000 | $ 25,000 | Includes updated CSM, full-scale injection design elements, well plan, and monitoring program. |
| C. | Bid Documents and Support | 1 | LS | $ 5,000 | $ 5,000 | Subcontractors, procurement, and planning. |
| D. | Permitting - Wells | 1 | LS | $ 5,000 | $ 5,000 | Permits through City of San Francisco and Port of San Francisco. |
| | | | | **SUBTOTAL:** | **$ 42,500** | |
| **II.** | **REMEDIATION IMPLEMENTATION**<br>WELL INSTALLATION | | | | | |
| A. | Well Installations | 5 | EA | $ 6,000 | $ 30,000 | Installation of 5 monitoring wells in the remedial excavation footprint wells (5 days). |
| B. | Well Installation Oversight | 1 | LS | $ 15,400 | $ 15,400 | 5 days of drilling oversight plus preparation |
| | | | | **SUBTOTAL:** | **$ 45,400** | |
| **III.** | **ENVIRONMENTAL CONSULTING SERVICES DURING GROUNDWATER REMEDIATION** | | | | | |
| A. | Data Analysis, Community Notifications, Access Management, Health and Safety | 1 | LS | $ 15,000 | $ 15,000 | |
| B. | Client Consultation | 1 | LS | $ 20,000 | $ 20,000 | Presence at kickoff meeting and conference calls. |
| C. | Agency Meetings | 12 | EA | $ 2,500 | $ 30,000 | Quarterly meetings with regulatory agencies for 3 years. |
| | | | | **SUBTOTAL:** | **$ 65,000** | |

# Table 3
## Preliminary Remediation Cost Estimate - Alternative: Groundwater Remediation Using Monitored Natural Attenuation
## Hyde Street Study Area
## San Francisco, California
## PN: 2609-001

| | ITEM | QUANTITY | UNIT | COST | TOTAL COST | ASSUMPTION |
|---|---|---|---|---|---|---|
| **IV.** | **QUARTERLY MONITORING AND REPORTING** | | | | | |
| A. | Groundwater monitoring, sampling, testing, and waste management | 12 | Event | $ 8,000 | $ 96,000 | Quarterly groundwater sampling and analysis. Quarterly monitoring of 18 wells for 12 events, and waste disposal. |
| B. | Weekly Product Removal | 156 | Event | $ 2,000 | $ 312,000 | Weekly product skimming from monitoring wells for three years. |
| C. | Quarterly Monitoring Reports | 12 | Event | $ 10,000 | $ 120,000 | |
| D. | Annual Reports | 3 | Event | $ 15,000 | $ 45,000 | |
| | | | | **SUBTOTAL:** | **$ 573,000** | |
| **V.** | **LONG-TERM REMEDIATION PERFORMANCE MONITORING AND REPORTING** | | | | | |
| A. | Groundwater Monitoring, Sampling, Testing, and Waste Management | 12 | Event | $ 10,000 | $ 120,000 | Assumes annual sampling of 18 monitoring wells over a 12-year period |
| B. | Annual Monitoring Reports | 12 | Event | $ 15,000 | $ 180,000 | |
| C. | 5-Year Progress Reports | 3 | Event | $ 15,000 | $ 45,000 | |
| | | | | **SUBTOTAL:** | **$ 345,000** | |
| **VI.** | **REMEDIATION CLOSEOUT** | | | | | |
| A. | Remediation Completion Report | 1 | LS | $ 25,000 | $ 25,000 | |
| B. | Monitoring Well Removal | 18 | LS | $ 5,000 | $ 90,000 | Assumes 18 monitoring wells removed over 6 days. |
| C. | Monitoring Well Removal Oversight | 1 | LS | $ 17,600 | $ 17,600 | Assumes 6 days of drilling oversight plus preparation |
| C. | Monitoring Well Removal Report | 1 | LS | $ 15,000 | $ 15,000 | |
| | | | | **SUBTOTAL:** | **$ 147,600** | |

# Table 3
## Preliminary Remediation Cost Estimate - Alternative: Groundwater Remediation Using Monitored Natural Attenuation
## Hyde Street Study Area
## San Francisco, California
## PN: 2609-001

| ITEM | | QUANTITY | UNIT | COST | TOTAL COST | ASSUMPTION |
|---|---|---|---|---|---|---|
| **VII. IMPLEMENTATION OF INSTITUTIONAL CONTROLS (ICs)** | | | | | | |
| A. | Preparation of Deed Restriction, Legal Description, Notification Signage, and Outreach | 1 | LS | $ 30,000 | $ 30,000 | |
| | | | | **SUBTOTAL:** | **$ 30,000** | |
| | | | | | | |
| | | | | Total Capital Costs | $ 1,248,500 | |
| | | | | 30% Contingency | $ 374,550 | |
| | | | | **TOTAL:** | **$ 1,623,050** | |

**NOTES:**

1. This Preliminary Remediation Cost Estimate is only for a component of the remedial action and does not reflect a stand-alone or comprehensive remedial action.
2. This Preliminary Remediation Cost Estimate was prepared in consideration of the environmental data presented in the *Site Investigation Report, Hyde Street Study Area, 2950 Hyde Street, San Francisco, California dated* February 8, 2022 prepared for Pilot Thomas Logistics LLC (formerly Maxum Petroleum, Inc.) by Farallon Consulting, L.L.C.
3. This Preliminary Remediation Cost Estimate is an approximate cost of construction, and reflects available cost information for construction located in the San Francisco Bay Area, California.
4. This Preliminary Remediation Cost Estimate represents an opinion of the probable costs of construction, within a reasonable degree of certainty. This estimate does not guarantee the cost of labor, material, or equipment, nor the means, methods, or procedures of the Contractor's work as determined by the Contractor and/or Owner, nor the competitive bidding submissions.
5. This Preliminary Remediation Cost Estimate of probable construction cost is based on Farallon's experience and qualifications as an engineer, and shall be deemed to represent Farallon's opinion and judgment. This estimate cannot and does not guarantee that proposals, bids, or actual costs will be the same as or within any specific percentage of this estimate of probable construction cost.
6. This Preliminary Remediation Cost Estimate is an order-of-magnitude estimate, has been developed for the sole purpose of evaluating and comparing potential remedial action alternatives, is assumed to be accurate within -25% to +25%, and may require adjustment if new information becomes available.
7. Inherent in soil, foundations, groundwater, and other environmental investigations, actual conditions may vary materially from those noted at test points or sample intervals. Because of these inherent uncertainties, changed or unanticipated conditions may arise during construction activities at the project site subsequent to the initial investigation(s) that could potentially affect project scope and cost. Therefore, this estimate, with respect to potential construction costs, including environmental remediation costs, shall not be deemed a guaranteed maximum price or cost of the project.

bgs = below ground surface
CSM = conceptual site model
EA = each
LS = lump sum
ORC = oxygen-release compound
Qtr = quarter

**ASSUMPTIONS/EXCLUSIONS:**

1. This estimate does not include General Contractor’s overhead, profit, and general conditions.
2. All unit prices shown in this estimate should be verified by a local Contractor.

**Table 4**
**Preliminary Remediation Cost Estimate for Site Remediation - Summation of Tables 2 and 3**
**Hyde Street Study Area**
**San Francisco, California**
**PN: 2609-001**

| Remedial Action Component | Subtotal | Total |
|---|---|---|
| Partial Soil Removal | $ 1,510,080 | |
| Groundwater Remediation Using Monitored Natural Attenuation | $ 1,623,050 | |
| | | **$ 3,133,130** |

**NOTES:**

1. Refer to notes in Tables 2 through 4 for details, assumptions and exclusions.

# APPENDIX A
# SITE MANAGEMENT, LNAPL RECOVERY, AND GROUNDWATER MONITORING PLAN

FEASIBILITY STUDY AND REMEDIAL ACTION PLAN
Hyde Street Harbor Facility
2950 Hyde Street
San Francisco, California

Farallon PN: 2609-001

# SITE MANAGEMENT, LNAPL RECOVERY, AND GROUNDWATER MONITORING PLAN

## Hyde Street Study Area
## 2950 Hyde Street
## San Francisco, California

**Farallon PN: 2609-001**

**September 14, 2023**


Prepared by:

Martin Hamann, P.G.
Principal Hydrogeologist

Reviewed by:

James Schwartz, P.G.
Principal Geologist

For:
Pilot Thomas Logistics LLC
(formerly Maxum Petroleum, Inc.)
Hyde Street Harbor Facility
442 Jefferson Street
San Francisco, California

Submitted by:
Farallon Consulting, L.L.C.
330 Franklin Street, Suite 200
Oakland, California 94607

## TABLE OF CONTENTS

## FIGURES



## APPENDICES

# 1.0 INTRODUCTION

Farallon Consulting, L.L.C. (Farallon) has prepared this Site Management, LNAPL Recovery, and Groundwater Monitoring Plan (SMP) for Pilot Thomas Logistics, LLC (Pilot Thomas), formerly Maxum Petroleum, Inc. (Maxum), to provide the framework for management of the remedial activities implemented as part of the Hyde Street Harbor Petroleum Seep in San Francisco, California (herein referred to as the Site). This SMP outlines the steps that will be taken to manage environmental issues at the Site and details related to the light nonaqueous-phase liquid (LNAPL) recovery and groundwater monitoring.

This SMP has been prepared prior to the implementation of the proposed remedial actions envisioned on the Site. As such, specific details regarding activities described herein may be modified based on the actual remedial actions implemented.

## 1.1 REPORT ORGANIZATION

This document has been organized into the following sections:

- Section 2: Site Description and Background,
- Section 3: Known Environmental Conditions,
- Section 4: Project Team Roles and Responsibilities,
- Section 5: Site Management Plan,
- Section 6: LNAPL Recovery and Groundwater Monitoring Plan,
- Section 7: Health and Safety,
- Section 8: References, and
- Section 9: Limitations.

# 2.0 SITE DESCRIPTION AND BACKGROUND

This section provides a description of the Site and its historical use, the general Site setting, regional geology and hydrogeology, and the Site regulatory status.

## 2.1 SITE DESCRIPTION

The Site was described as "the discharge of oil into Hyde Street Harbor, approximately 250 feet northeast of the intersection of Hyde Street and Jefferson Street, San Francisco, California." The Site is generally within portions of San Francisco City and County Assessor Parcel Nos. 0007001, 0002001, and 9900250. The Site is bounded to the north by Hyde Street Harbor, to the east by Leavenworth Street, to the south by Jefferson Street, and to the west by Hyde Street (Figures 1 and 2).

The marine fueling facility at 442 Jefferson Street in San Francisco, California, leased and operated by Pilot Thomas, is within the boundaries of the Site (Figures 1 and 2). The Site and the marine fueling facility are owned by the Port of San Francisco (the Port). The marine fueling facility is bounded by San Francisco Bay to the north; Alioto Lazio Fish Co. to the east; Jefferson Street to the south; and SF Silver Fox Sport Fishing and Tours and the 482 Jefferson Street Parking Lot to the west. An asphalt driveway and a pedestrian walkway connected to Jefferson Street are present parallel to and east of Hyde Street, connecting the 482 Jefferson Street Parking Lot to a parking lot adjacent to a fuel dock. The marine fueling facility and nearby properties are zoned C 2 District: Community Business.

The marine fueling facility includes a fuel dispenser on a floating dock, and a fuel storage area with two double-walled 20,000-gallon aboveground storage tanks (ASTs). The ASTs are connected to 4-inch-diameter steel fuel-supply pipes within fiberglass secondary containment. The product-supply pipeline extends underground from the ASTs, emerges above ground beneath the pile-supported dock, and then connects to the fuel dispenser on the floating dock. The remote filling pipeline extends underground from a fill port to the ASTs, as shown on Figure 2. The pipes are approximately 3 to 4 feet below ground surface (bgs), with the exception of the aboveground pipeline segment beneath the dock. Trench plates cover four small excavations that expose the buried piping. A truck-fill connection shed in a parking lot west of the fuel storage area was used to offload fuel from trucks for transfer into the ASTs.

The double-walled ASTs are on a concrete surface within secondary containment that has a storage capacity of 22,000 gallons. A 2.7-foot-high concrete containment wall that surrounds the ASTs serves as tertiary containment for the ASTs, and as secondary containment for aboveground piping present in the fuel storage area. A concrete-lined sump within this containment area collects stormwater that falls in the fuel storage area.

## 2.2 ENVIRONMENTAL SETTING

### 2.2.1 Surface Water

The Site and San Francisco Bay to the north are within the surface water of the San Francisco Bay Central Basin. Surface waters have received R99 diesel. The surface water north of the Site is equipped with booms to capture released R99 diesel and prevent it from migrating into San Francisco Bay.

### 2.2.2 Geology and Soil

The Site is in the San Francisco Sand Dune Area Basin, a part of the San Francisco Bay Basin. Heterogeneous fill material consisting of a mix of clays, silts, sands, gravels, debris, and boulders underlies the Site to a depth of approximately 17 feet bgs. Loose sands and silty clay are present beneath the fill. Underlying the loose sands and silty clay are undifferentiated Quaternary sediments known as the Bay Mud, consisting of interbedded sands, clays, and sandy clays. The thickness of the Bay Mud is approximately 125 feet regionally. The Franciscan basement formation underlies the Bay Mud (Acton Mickelson Environmental, Inc. 2009).

Subsurface soil observed in borings completed at the Site by CDIM Engineering (2021) consists of a mix of natural backfill from local excavation, and assorted urban waste and debris from building demolition associated with the 1906 earthquake. Soils encountered in the borings consisted generally of yellow-brown and dark gray sandy, sometimes gravelly, silts, which were sometimes interbedded with layers of well-sorted sand. Intermittent layers of debris material such as wood chips, glass shards, bricks, and metal fragments were observed. The sediments observed during soil logging were consistent with artificial fill commonly found along the San Francisco waterfront. A more-detailed summary of subsurface soil conditions at the Site is provided in Section 3, Known Environmental Conditions.

### 2.2.3 Hydrogeology

Groundwater is tidally influenced; the depth to groundwater ranges from approximately 4 to 10 feet bgs. Groundwater flow direction is predominantly north toward Hyde Street Harbor, although tidal fluctuations may change groundwater flow direction. Groundwater is not a source of drinking water, and is not likely to become a drinking water source in the foreseeable future.

As part of an LNAPL recovery pilot study, documented in the Pilot Study Summary Technical Memorandum (Farallon 2022b), the depth to groundwater at 13 groundwater monitoring wells was monitored on a daily or more-frequent basis to evaluate the effect of tidal fluctuations on depth to groundwater. The depth to groundwater was found to be directly affected by tidal fluctuations, and to show a close correlation between time and change in depth to groundwater and the distance from open water. The tidal study was summarized in the Site Investigation Report (Farallon 2022a).

## 2.3 REGULATORY STATUS

Although the U.S. Environmental Protection Agency (EPA) was the primary lead for environmental oversight in the early stages of the Site investigation, the San Francisco Bay Regional Water Quality Control Board (Water Board) was included, copied on correspondence and reports, and contributed to and complemented the EPA lead role. On July 27, 2022, EPA (2022) determined that no additional work would be required from Maxum and Pilot Thomas under the EPA Order to Maxum and the amended Order that added Pilot Thomas as a Respondent, and terminated the Orders and its involvement in oversight. EPA noted that the Water Board retained jurisdiction to oversee ongoing remediation at Hyde Street Harbor.

The Water Board subsequently has taken the lead for regulatory oversight, requiring interim remedial activities, reports, and preparation of a remedial action plan.

# 3.0 KNOWN ENVIRONMENTAL CONDITIONS

The following section summarizes the nature and extent of R99 diesel impacts on the various media at the Site.

## 3.1 SOIL IMPACT NATURE AND EXTENT

Analyses conducted at the Site show a close and direct correlation between R99 diesel in LNAPL and impacted soil. In areas where R99 diesel has been observed as LNAPL, R99 diesel in soil also has been observed. No areas where impacted soil was observed absent of impacted groundwater were identified during prior investigations. As such, the extent of impacted soil most-closely correlates with the presence of LNAPL.

## 3.2 GROUNDWATER IMPACT NATURE AND EXTENT

Analyses conducted at the Site show a close and direct correlation between R99 diesel in LNAPL and impacted groundwater. In the areas where R99 diesel was observed as LNAPL, R99 diesel in groundwater was also observed. No areas where impacted groundwater was observed absent of nearby LNAPL on groundwater were identified during prior investigations. As such, the extent of impacted groundwater most-closely correlates with the presence of LNAPL. It should be noted that over time and with the twice-daily ebb and flow of the tides, LNAPL likely has spread from its earlier position, and in the process of spreading has had an opportunity to dissolve into the groundwater.

## 3.3 SOIL VAPOR AND INDOOR AIR IMPACT NATURE AND EXTENT

Soil vapor and indoor air evaluations found that air and soil gas screening levels for the total petroleum hydrocarbon (TPH) fractions calculated by the Water Board were not exceeded. Additionally, volatile organic compound (VOC) concentrations exceeding the commercial/industrial Environmental Screening Levels (ESLs), promulgated by the Water Board, were not detected in any of the subslab soil vapor samples and concluded that vapor intrusion attributable to the R99 diesel release is not occurring. Indoor air VOC concentrations are not attributable to vapor intrusion as a result of the R99 diesel release. Localized indoor air sources not associated with the R99 diesel release are likely causing increased the indoor air VOC concentrations. There were no indications that chemicals from the R99 diesel release are adversely impacting indoor air (Farallon 2023a and 2023b pending).

# 4.0 PROJECT TEAM ROLES AND RESPONSIBILITIES

Key project team members along with their expected roles and responsibilities are identified below.

## 4.1 PROPERTY OWNER/PROJECT MANAGER

The Port (the Property Owner) has designated Shannon Alford to represent the Property Owner. The primary responsibilities of this position with respect to the SMP include:

- Provide overall approval of the SMP;
- Sign environmental permits when required;
- Provide final authority in key decisions when necessary; and
- Ensure the project has adequate resources and delegated authority to implement the SMP.

## 4.2 CONTRACTOR AND CONSTRUCTION MANAGER

While there are currently no plans for construction on the Site, the Contractor will be the party selected to conduct potential future intrusive (e.g., soil moving) activities and will be led by the Construction Manager. The primary responsibilities of the Construction Manager with respect to the SMP and environmental management during potential future intrusive activities include:

- Lead overall engineering design and construction of the project;
- Lead overall management of the construction contractors; and
- Serve as liaison between the design/construction team and the environmental team.

## 4.3 ENVIRONMENTAL MANAGER

The Property Owner has selected Farallon as its environmental consultant to implement the required environmental services. Martin Hamann, P.G. and C.H.G., is Farallon's designated Environmental Manager for this project. The primary responsibilities with respect to the SMP and environmental management include:

- Implement and evaluate compliance with the SMP. The Environmental Manager will recommend actions necessary to ensure continued compliance with the SMP, as authorized by the Property Owner.

- Lead overall coordination and communication between the environmental team, any potential construction team, and the Property Owner's team.
- Obtain the appropriate environmental permits where required and agency-required correspondence.
- Ensure health and safety and environmental compliance for the on-Site Environmental Monitoring Technician.
- Manage and ensure overall performance of the on-Site Environmental Monitoring Technician.
- Prepare documentation and maintain recordkeeping that demonstrates compliance of the development process with the SMP.
- Serve as liaison and lead communications with regulatory agencies (if needed) on environmental matters.
- Prepare environmental technical documents, specifications, and draft agency correspondence as needed.

## 4.4 ENVIRONMENTAL MONITORING TECHNICIAN

A Farallon geologist or scientist will be the designee of the Environmental Manager as the on-Site Environmental Monitoring Technician for the development project under the direct supervision of the Environmental Manager. The primary responsibilities with respect to the SMP and environmental management include:

- Facilitate safe environmental practices if there were to be construction activities on the Site;
    - Use the criteria in the SMP to identify new discoveries of VOC- and TPH-affected soil, soil vapor, and groundwater (if encountered), and heavy metal-affected soil and groundwater; cordon them off; and follow established procedures;
    - Conduct visual observations of soil during grading to identify potential affected soil;
    - Observe, monitor, prepare records, and potentially collect soil vapor, soil, and/or groundwater samples in accordance with the SMP;
    - Coordinate with the project analytical laboratory for sample analysis and reporting in accordance with the SMP;

    - Record on-Site observations and maintain records to ensure compliance with environmental permits and regulations;
    - Communicate and coordinate with the on-Site Construction Manager and Environmental Manager; and
    - Serve as on-Site environmental liaison in the event of an on-Site environmental agency inspection of the development when the Environmental Manager is unavailable.
- Conduct regular periodic environmental monitoring and maintenance of the remedial actions put in place on the Site;
    - Conduct groundwater sampling;
    - Conduct LNAPL recovery;
    - Record on-Site observations and maintain records to ensure compliance with environmental permits and regulations;
    - Communicate and coordinate with the on-Site Construction Manager and Environmental Manager; and
    - Serve as on-Site environmental liaison in the event of an on-Site environmental agency inspection of the development when the Environmental Manager is unavailable.

## 4.5 REGULATORY AGENCY PROJECT MANAGER

Michelle Thompson, PhD, is the assigned Water Board case manager for the Site.

# 5.0 SITE MANAGEMENT PLAN

This section describes general Site management objectives to prevent unauthorized exposure to potential chemicals on the Site. It is anticipated that the occurrence of such exposures would be greatest during construction activities as soil and groundwater are covered by concrete or asphalt and general activities on and around the Site are not expected to pose a material concern under normal operating conditions. The objective of this section is to minimize risk to human health and to ensure protection of the environment during activities associated with construction or future development of the Site. Before any earthwork activities commence at the Site, this SMP should be made available to workers to address possible environmental risks associated with chemically impacted soil or unanticipated subsurface conditions. This SMP is applicable to potential earthwork activities that may be performed on the Site.

This SMP is intended for use in conjunction with construction or redevelopment activities that may be conducted in the future. This SMP is intended to supplement and not supersede any required construction permits, bid specification plans, and documents.

The following sections present the management protocols for handling, moving, and stockpiling (if necessary) of soil during earth-disturbing activities at the Site. Contingency protocols to be followed when unknown contamination or underground structures are identified are also presented.

## 5.1 OVERVIEW OF SOIL AND GROUNDWATER DISTURBANCE ACTIVITIES

Improvements to the Site may include activities causing soil disturbance through the import of fill to raise Site elevations, Site grading, and installation of utilities for the Site improvements.

Groundwater was previously encountered on the Site from depths of approximately 6 to 8 feet bgs. Depending on the construction activity, localized temporary groundwater dewatering may be required.

## 5.2 SITE PREPARATION AND ACCESS CONTROL

To the extent that access controls are needed, the Contractor will construct a locked fence around the work area to restrict access to unauthorized persons. The Contractor will maintain the fencing throughout the duration of the construction project. Gates and access points will be locked by the Contractor at the end of each work shift. In addition, signage indicating “No Trespassing” will be posted on all sides of the property/work area at 100-foot intervals to inform individuals that unauthorized access to the area is strictly prohibited. During earthmoving work, additional signs will be posted adjacent to the "No Trespassing" signs that include contact names and phone numbers for the Property Owner, Contractor, and for other agencies, if applicable. Any fencing added as part of the Contractor’s work will be removed at the completion of the project.

The Property Owner or their designate will obtain all permits required to perform the specified construction work. These permits will require a commitment by the Contractor to implement standard dust control methods, to minimize tracking soil off the Site, and to mitigate stormwater and waste discharges from the construction zone to storm drains. It should be noted that the Property Owner and their environmental consultant are responsible for ensuring the Contractor follows the SMP with respect to implementing the dust control measures and minimizing track-out and discharges.

The following people must be notified 48 hours prior to beginning any ground disturbing activities:

| Contact | Phone | Email |
|---|---|---|
| Shannon Alford, Senior Environmental Planner | (415) 336-0888 | shannon.alford@sfport.com |
| Martin Hamann, Principal Hydrogeologist, Farallon | (714) 421-1740 | mhamann@farallonconsulting.com |

In the event of an emergency or if unanticipated soil conditions are encountered (such as unusual odors or staining of soils), the contacts in the list above should be notified immediately.

## 5.3 STORMWATER POLLUTION PREVENTION

If the amount of land disturbed is greater than the 1-acre threshold, a Stormwater Pollution Prevention Plan (SWPPP) (California State Water Resources Control Board 2010) would be required for this project.

The Contractor will develop, implement, and maintain an appropriate SWPPP during all required phases of construction. While there may be some overlap in the procedures used to execute the SWPPP, this SMP does not alleviate the need for a SWPPP.

## 5.4 DISCOVERY OF UNANTICIPATED SUBSURFACE DEBRIS, STRUCTURES, OR AFFECTED SOIL

Appropriate protocols will be followed to identify the contaminants in the apparently affected soil discovered during Site development. These protocols will be followed by all involved parties, including the Property Owner, Environmental Manager, and Construction Manager identified in this SMP.

Unknown conditions (e.g., affected soil) that may trigger contingency monitoring procedures during Site development include, but are not limited to, those conditions listed below. Discovery of any of these conditions could require either alternative or additional measures to protect human health and the environment:

- Oily, shiny, or saturated soil or free product;
- Soil with a strong chemical odor;
- Discovery of objects of environmental concern such as underground storage tanks (USTs) and associated piping or buried drums;
- Discovery of debris (e.g., buried refuse, asbestos-containing pipes); and
- Other conditions that vary materially from those documented during previous investigations.

### 5.4.1 Pipes

If a previously unknown pipeline is discovered, it may not be necessary to remove all of a discovered pipe, beyond what may be necessary to complete construction, if the pipe does not contain or is not near contaminated, hazardous, flammable, or explosive soil, liquid, sludge, or gas. Under these conditions, the pipe may be cut, removed, and the ends of the remaining portion capped. The removed pipe will be disposed of in accordance with applicable laws and regulations. In the event materials suspected of containing asbestos are uncovered during demolition or development activities, the materials will be investigated and sampled by a qualified licensed inspector and analyzed for asbestos content prior to any disturbance. If the pipe material contains asbestos (e.g., asbestos-cement commonly referred to as transite), the material will be handled in accordance with applicable air quality and hazardous waste management laws and regulations and appropriate protocols for handling asbestos-containing materials.

### 5.4.2 Affected Soil

If suspected affected soil is observed during subsurface disturbance work, the following procedures will be followed:

- All field activities that may potentially disturb the suspected affected soil will be stopped and the Property Owner, Environmental Manager, and Construction Manager are to be notified immediately. The Environmental Manager will work with the Property Owner and the Construction Manager to determine what areas and construction activities can occur to continue work without impacting suspected affected soil.
- If an emergency situation arises that requires emergency services, call 911 and follow the emergency procedures provided in the Health and Safety Plan (HASP) reference (Section 7).
- Notify the Water Board within 24 hours and determine whether a site visit by the Regulatory Agency Project Manager (or designate) should be conducted. Moving and stockpiling of unanticipated subsurface debris, structures, or affected soil should not occur unless previously approved.
- Any equipment and/or clothing that comes into contact with the suspected or known affected soil must be decontaminated as specified in the HASP (Section 7). Contact the Environmental Manager for support.
- If stockpiling is necessary, stockpiles will be placed on plastic sheeting and covered at the end of each workday.

### 5.4.3 Tanks, Sumps, or Other Underground Structures

During excavation and construction activities conducted at the Site, it is possible that USTs, sumps, or other underground structures that were not identified during previous site investigations may be discovered. Other subsurface structures might not have features that extend above the excavated surface and could be unearthed when construction equipment comes into contact with them. The remainder of this section outlines the measures that govern identification and removal of USTs, and appropriate measures for addressing other underground structures encountered during development.

Chapter 6.7 of the California Health and Safety Code contains the specific requirements for removing and remediating affected soil associated with a leaking UST (LUST). The county within which the UST is encountered is responsible for local oversight and oversees the removal of USTs. Environmental investigations and responses required following removal of the UST will be conducted under the direction of the Water Board and in accordance with the specific provisions delineated in Chapter 6.7 of the California Health and Safety Code. Accordingly, the Water Board and Bay Area Air Quality Management District (BAAQMD) will be notified in the event that a UST or appurtenant piping is discovered during construction and development of the Site.

For other encountered subsurface structures that may have been related to the former use and storage of chemicals, such as underground vaults and sumps, the following procedures will be implemented to determine the proper disposition of the encountered structures.

The structure will be inspected to assess whether it contains any indication of chemical residuals or free liquids other than water. The environmental engineer will make this assessment in the field using visual, olfactory evidence, and field monitoring equipment. If there is no indication, based on visual observation, odor, and field monitoring equipment, of chemical impact within and immediately surrounding the vault or sump, then removal of the structure will be conducted to assess chemical impact beneath the vault or sump. The procedures outlined above for unknown conditions will be implemented.

If a sump or vault contains liquids that appear to be affected by hazardous chemicals, based on visual observations, odor, or field monitoring equipment, the following steps will be taken:

1. The chemical will be characterized, and the appropriate response action will be determined.
2. The potentially hazardous chemical-affected liquids will be sampled and analyzed for profiling purposes.
3. Any hazardous liquids will be properly removed and disposed of under the direction of the Property Owner or the designated environmental engineer.
4. A report will be prepared documenting response activities for submittal to the Water Board.

If unanticipated chemical-affected soil is encountered, it must be described and documented in a report that is submitted to the Water Board within 30 days after the discovery of the unanticipated chemical-affected soil. This report will include the following:

- A brief description of the nature of the suspected chemical-affected soil and the means by which it was discovered;
- Verification that the procedures outlined in this SMP were followed; and
- Analytical results for all site characterization data (including stockpile and confirmation sampling) collected.

### 5.4.4 Stockpile Management

Soil may be stockpiled on the Site or directly loaded and off-hauled from the Site as soon as it is excavated. Until waste characterization is confirmed by laboratory testing, excavated soils and materials will be handled and stored as appropriate. A clear record will be kept by the Construction Manager on a weekly basis for each stockpile regarding excavation date, sampling date, analysis date, and reuse date and location, or disposal date. The stockpiles will be placed on polyethylene sheeting and covered unless in use to prevent off-Site soil migration if necessary. The covers will consist of plastic sheeting and/or non-toxic soil binders. The Construction Manager will have the following responsibilities concerning the on-Site stockpiles:

- Monitoring the stockpile covers on a daily basis;
- Ensuring that accumulation records are maintained and kept in a field book on-Site describing where soil was excavated and the approximate amount of soil in each stockpile; and
- Monitoring the fences surrounding the construction site for open gates or holes to prevent unauthorized access by the public.

If necessary, mitigation procedures to prevent wind erosion of the stockpiles, including spraying them with enough water or another accepted material to keep the soil slightly damp but not enough to create runoff from oversaturation, will be implemented. Stockpiles will not be piled excessively high in a further attempt to inhibit airborne transport of stockpile material.

The following procedures will be implemented for VOC-affected soil, if encountered, in accordance with BAAQMD Regulation 8:

- During excavation, all exposed affected soil surfaces above existing grade level will be kept visibly moist by water spray, treated with an approved vapor suppressant, or covered with continuous heavy duty plastic sheeting or other covering to minimize emissions of organic compounds to the atmosphere. The covering will be in good condition, joined at the seams, and securely anchored to minimize headspace where vapors may accumulate.
- All affected soils loaded into trucks or trailers for off-Site disposal or treatment will be covered with continuous heavy duty plastic sheeting or other covering to minimize emissions to the atmosphere. The covering will be in good condition, joined at the seams, and securely anchored to minimize headspace where vapors may accumulate.
- All affected soil will be stockpiled separately from soil that is not affected, unless emissions of VOCs from the storage pile are minimized.
- Within 45 days of excavation, all affected soil will be removed from the Site.

Affected soil will not be used as backfill and on-Site treatment to remove contamination is not authorized.

Stockpiles will not be located off the Site but rather left on the Site. Stockpile locations will depend on the location of unanticipated subsurface debris, structures, or affected soil, if encountered, and development activities.

The on-Site stockpiled soils (and other excavated materials) will be identified with a waste identification label to include type of waste; date of first accumulation; suspected constituents of concern (COCs); contact name, address, and phone number; and a Proposition 65 notification.

### 5.4.5 Waste Characterization and Handling Procedures

Whenever possible and applicable, the unanticipated affected soil or other material excavated and stockpiled during Site activities will be profiled for off-Site disposal to an appropriate facility. Given the space limitations, the intention of the soil management is to direct load all excavated soil as it is generated and dispose of it at facilities that have cleared its acceptance based on the completed pre-profile screening. Suspected affected soil (e.g., soil encountered that is considered not to be represented by the pre-profiling due to exhibiting discoloration, foreign liquids, powders or other substances, odors, or detections on field equipment) will be tested and classified as required by the off-Site receiving facility. None of the excavated soil is to be reused on the Site.

The State of California's hazardous waste regulations, the Resource Conservation and Recovery Act (RCRA), and other applicable waste management regulations have requirements and procedures for handling waste. The regulations regarding land disposal of waste are overseen by the California Department of Toxic Substances Control (DTSC). Generators of waste resulting from Site activities will be responsible for characterizing the waste to determine whether the material should be classified as hazardous or nonhazardous according to California regulations (Title 22, California Code of Regulations [CCR]). Generators are defined as the person(s) or organization(s) involved that produce the waste, or whose actions cause the waste to be subject to Title 40, Code of Federal Regulations (CFR) 260.10. All generated wastes must be adequately characterized to ensure proper waste management and disposal to the proper facility. The waste will be characterized by either using the standard EPA testing methods or by applying knowledge to the process in which the waste was generated (e.g., Site history information and analytical data collected from the waste streams).

Profiling of the waste for the off-Site disposal facility will be necessary to determine proper disposal methods, verify that the waste meets acceptance criteria of the disposal facility, and ensure compliance with all federal, state, and local regulations. Waste characterization samples will be collected within 30 days of the waste accumulation start date. Wastes generated from Site construction activities that are unanticipated and wastes encountered that do not appear to be represented by the pre-profiling allowing for direct loading will be separated in stockpiles and classified into hazardous and nonhazardous wastes based on the additional analysis completed. California regulations state that hazardous waste must be removed from the Site within 90 days from the first date on which any amount of hazardous waste starts to accumulate. Other waste (nonhazardous) accumulated on the Site will be removed from the Site as soon as possible. If the soil is not considered representative of the pre-profiling completed for direct loading, the following actions will occur:

- The waste soil will be temporarily stockpiled adjacent to the area where it was excavated.
- All stockpiles will be placed on plastic sheeting, with covers and perimeter berms to prevent off-Site migration of soil and runoff due to rain erosion.

- Stockpile covers will be secured in place when stockpiles are not in use.
- A daily inspection of the stockpiles will be conducted to ensure the integrity of protection used on the stockpiles.
- All inspections along with records of accumulation dates of the stockpiles will be recorded and maintained on the Site and provided in the development activities reports and completion report.
- Any accumulated free liquids will be removed and placed in containers.
- The hazardous waste will not be diluted unless allowed by state and federal regulations.
- All transportation of hazardous waste will be conducted in accordance with regulatory requirements.

The hazardous waste areas will contain emergency equipment sufficient to respond to the hazards created by the waste, such as spill response kits, spill containment kits, absorbent pads, and dust suppressants. Waste characterization will require the collection and analysis of laboratory samples. All sampling and laboratory analysis methods will be conducted in accordance with generally acceptable laboratory practices using California State Environmental Laboratory Accreditation Program (ELAP) laboratories.

In the event that suspected asbestos-containing materials are uncovered during demolition or development activities, the materials will be investigated and sampled by a qualified licensed inspector and analyzed for asbestos content prior to any disturbance.

## 5.5 GROUNDWATER MANAGEMENT

Groundwater may be encountered during excavation activities. Localized dewatering of areas may be necessary; however, that will be evaluated during construction. If dewatering is required, the Contractor will be responsible for providing equipment (e.g., holding tanks, filtration systems) to contain groundwater. The Environmental Manager will arrange testing to determine the appropriate off-Site disposal method, either through an off-Site transporter to a licensed wastewater treatment facility or pre-treated and discharged under permit. The groundwater will be sampled and analyzed in accordance with the accepting facility requirements. Groundwater will not be used for any on-Site development activities. Groundwater will not be discharged directly into San Francisco Bay or the storm sewer system unless an appropriate permit is obtained from the State Water Resources Control Board. Groundwater can be discharged into the sewer system based on a Wastewater

Special Discharge Permit obtained from the appropriate sanitary sewer district. A permit for discharge will be obtained if needed, or recovered groundwater will be containerized and disposed of in accordance with applicable regulations.

## 5.6 SOIL SAMPLING FOR WASTE CHARACTERIZATION AND OFF-SITE DISPOSAL

To the extent that additional soil sampling is required during the Site construction phase as a result of the outside receiving (landfill) facility request or other request, the characterization sampling procedures in this section will be used. Discrete soil samples will be collected at a sampling frequency consistent with the receiving facility requirements. Each discrete sample will be collected to provide equal representation of soil volume. Soil samples collected for VOC analysis will use EnCore sampling methodology and preservation, or equivalent. Each sample will be labeled with a unique sample number, sample date and time, and the sampler's initials.

Samples will be placed on ice and transported under proper chain-of-custody protocols to a California- certified laboratory for compositing and analysis.

Discrete samples may be analyzed for the following:

- TPH as gasoline using EPA Method 8015M, and
- VOCs using EPA Method 8260B.

Analytical results will be electronically transmitted to the Property Owner and the Environmental Manager and will be used to evaluate the appropriate potential reuse options for soil.

Composite soil samples will be collected at a sampling frequency consistent with the receiving facility requirements.

The stockpile soil samples will be collected using the following methods: A core-barrel, which accepts 2-inch-diameter 6-inch-long stainless steel sleeve inserts, will be driven 6 inches into the soil (or stockpile) using a slide hammer attachment or a 6-inch-long stainless steel sleeve will be driven 6 inches into the soil using a handheld hammer. The sleeve will be protected from damage by placing a piece of wood between the hammer and the sleeve. The sleeve will be removed from the soil (or stockpile) using a shovel. Upon collection of sampling, sleeves will be capped with Teflon sheets and plastic end caps, and labeled. Each sample will be labeled with a unique sample number, sample date and time, and the sampler's initials.

Samples will be placed on ice and transported under proper chain-of-custody protocols to a California-certified laboratory for compositing and analysis.

Composite samples may be analyzed for the following:

- TPH as diesel and as motor oil using EPA Method 8015M;
- Semivolatile organic compounds using EPA Method 8270C SIM; and
- Seventeen Title 22 Metals using EPA Method 6010/7471.

If the concentration of any metal is at or exceeds 10 times the respective California Soluble Threshold Limit Concentration (STLC) value, the California Waste Extraction Test method will be performed on the metal to determine whether the soil is considered a California Hazardous or non-RCRA Hazardous Waste.

If the concentration of any metal is at or exceeds 20 times the respective EPA toxicity characteristic leaching procedure (TCLP) limit, the TCLP test method will be performed on the metal to determine whether the soil is considered a RCRA Hazardous Waste.

Analytical results will be electronically transmitted to the Property Owner and the Environmental Manager and will be used to evaluate the appropriate potential reuse options for soil.

Upon formal acceptance of the soil for disposal from the selected receiving facility, the Environmental Manager will prepare all profiles and manifests for signature. A state-approved manifest system will be used so that wastes can be tracked from generation to ultimate disposal. All required manifest documentation will accompany each load of disposal materials, and copies of the final signed manifest will be forwarded to the Property Owner and the Environmental Manager.

## 5.7 IMPORTED FILL

If plans include importing fill onto the Site, the imported soils will be evaluated in a manner consistent with the DTSC (2001) Information Advisory, Clean Imported Fill Material guidance to confirm the soil is suitable for import (Appendix A). Soil will need to be chemically analyzed before being brought on or used at the Site to ensure that affected soil is not brought onto the Site.

## 5.8 SOIL TRANSPORTATION AND DISPOSAL

The Contractor will dispose of the excavated soil from the construction project by direct loading of the soil from the excavation in compliance with the California Department of Transportation and other applicable federal, state, and local regulations. As discussed above, a state-approved manifest system will be used so that wastes can be tracked from generation to ultimate disposal. The manifests will comply with all provisions of the appropriate transportation and disposal regulations.

Appropriate vehicles and operating practices will be used to prevent spillage or leakage of materials from occurring on the Site or on route to or from the construction zone. Trucks will be properly lined and securely covered prior to exiting. All transport vehicles will be thoroughly decontaminated and inspected before exiting. All vehicles leaving the work area(s) will be inspected to confirm that soil has not adhered to their wheels or undercarriage. Any such material must be removed at the work area or on a decontamination pad before the truck is allowed to exit the Site. Designated roadways that the vehicles take to and from the construction zone will be regularly inspected to ensure that no leakage or tracking of mud has occurred. If contaminated materials resulting from leaking or tracking are observed along the designated roadways, they will be cleaned immediately by the Contractor and the Contractor will implement additional procedures, as necessary, to prevent a recurrence.

## 5.9 PERIMETER AND WORK ZONE AIR AND DUST MONITORING AND CONTROL

During impacted soil excavation and stockpiling activities, dust control measures will be implemented by the Contractor in accordance with this SMP. Air monitoring will be performed to document that excavation activities and material handling operations when encountering anticipated and unanticipated affected soil or other material do not generate dust particulates or vapors above action levels in the work areas and at the property boundaries (e.g., fence-line). Perimeter air monitoring will be conducted during work activities anticipated that may encounter suspected affected soil and other material.

The Environmental Manager will perform perimeter air monitoring to evaluate the effectiveness of dust control measures used to protect the surrounding community from exposure to chemicals of concern during impacted soil excavation and stockpiling activities.

The air-monitoring program for this project consists of a combination of perimeter and work zone monitoring for particulates (dust) and vapors. Dust particles larger than 10 microns are likely to be associated with excavation and grading; therefore, comparison of data from the portable dust monitoring to Action Levels developed for PM10 is considered to be protective. For the purposes of this SMP, the Contractor will follow the PM10 action levels listed below:

- If perimeter action levels for dust of 0.036 milligrams per cubic meter ($mg/m^3$) plus background are exceeded, the Contractor will increase dust control measures and/or implement contingency measures for dust control.
- If work area action levels for dust of 2.5 $mg/m^3$ are exceeded, perimeter levels will be checked, and the Contractor will increase dust control measures and/or implement contingency measures for dust control, if needed.

Daily airborne dust monitoring will be conducted using data-logging real-time aerosol monitors during soil handling activities. Readings will be obtained at upwind and downwind directions where soil disturbing activities are occurring. The data collected will provide real-time information that will be used to demonstrate that Action Levels are met and evaluate the effectiveness of dust control procedures being implemented by the Contractor. The real-time aerosol monitors will be checked by the Contractor approximately every hour during the work shift to verify operation and compliance with the 2.5 $mg/m^3$ Action Level for the work area for increasing dust suppression and the Action Level of 20 $mg/m^3$ for temporary stopping of work. In addition, the real-time aerosol monitors will be programmed to alarm at 2.5 $mg/m^3$.

- If real-time aerosol monitors logs indicate the 2.5 $mg/m^3$ 5-minute average Action Level for PM10 is exceeded, the Contractor will increase dust suppression efforts.
- If real-time aerosol monitors logs indicate the 20 $mg/m^3$ 5-minute average Action Level for PM10 is exceeded, the Contractor will temporarily stop work and reassess site activities and dust control measures.

The stored data will be downloaded at the end of each work shift. The monitors will be factory calibrated and operated in accordance with the manufacturer's instructions. All of the perimeter samplers will be positioned at a height of approximately 5 feet to approximate the height of the human breathing zone.

Air monitoring will be conducted using real-time air monitoring devices consisting of monitoring the work area for VOCs using a photoionization detector (PID) and for methane using a Lower Explosive Level (LEL) monitor. Ambient air monitoring with a PID equipped with a 10.6 eV bulb will be used to prevent construction workers from entering a work area that has elevated concentrations of VOCs. Ambient air monitoring with an LEL will be used to prevent construction workers from entering a work area that has elevated concentrations of methane (exceeding 10 percent of the LEL). The Environmental Monitoring Technician will collect and log ambient air PID and LEL readings at select locations before work begins and hourly throughout the workday.

Ambient air monitoring will be conducted whenever the following conditions exist:

- Soil-disturbing activities are being performed.
- Workers are working in excavated areas.
- Work is being performed at temporary storage areas of potentially affected soil.
- Work begins at a different location that was not previously monitored that day.
- Change in weather conditions that may affect expected monitoring results.
- Change in Site conditions as noted by visual observation or sense of smell.

If the PID reading in the work area is sustained above 10 parts per million (ppm) for 1 minute, work will be stopped, workers will be immediately evacuated from the work area, and a vapor emission response action will be implemented. Workers may not return to the work area until PID readings drop below 10 ppm.

If the LEL reading in the work area is sustained above 10 percent of the LEL for 1 minute, work will be stopped, workers will be immediately evacuated from the work area, and a vapor emission response action will be implemented. Workers may not return to the work area until LEL readings drop below 10 percent.

After vapor mitigation has been implemented, the Environmental Monitoring Technician, using the proper level of personal protective equipment (PPE) specified in the project-specific HASP, will collect PID and/or LEL readings at a minimum of 15-minute intervals to assess whether the vapor levels have been reduced or eliminated. Workers will not be allowed to return to the work area until PID readings drop below 10 ppm and/or LEL readings drop below 10 percent.

To the extent possible, excavations will be scheduled in a staged manner that would allow for vapor emissions to be assessed in an area before workers are scheduled to perform work in the area. Staging the excavation would reduce the potential for worker exposure to VOCs and methane and prevent potential work shutdowns due to elevated air monitoring results.

Additional dust and vapor control activities may include:

- Provide a stabilized construction entrance/exit consisting of aggregate material.
- Apply water spray from a water truck or metered hydrant to moisten dry soils to minimize the generation of dust.
- Limit vehicle speed on-Site to minimize generation of dust.
- Minimize drop heights for loading and unloading of materials.
- Cover all dust-producing loads to and from the Site and require at least 2 feet of freeboard.
- Suspend dust-producing activities during periods of high wind speeds.
- Clean vehicle wheels using rubble strips or wheel washes to minimize track-out of soil from the Site.
- Sweep public streets near the Site to remove dust and soil that have been tracked from the Site by vehicles.
- Provide Natural Ventilation: Delay work or discontinue work in an area for a sufficient time to allow vapor levels to be reduced to acceptable levels.
- Provide Mechanical Ventilation: Fans can be placed in an area to reduce vapor levels to acceptable levels.
- Application of Water: Application of water will often reduce vapor levels. Water trucks will be made available for dust control and to mitigate vapor emissions if necessary.
- Higher Level PPE: Higher levels of worker protection per the project-specific HASP can be implemented, such as Level C PPE per 29 CFR 1910.134.

If the established dust or vapor levels are exceeded over a sustained period of time and cannot be managed using standard management controls, respiratory protection for Site workers will be required and additional air monitoring will be conducted.

## 5.10 DECONTAMINATION MEASURES

Construction equipment and transportation vehicles that contact soil will be decontaminated prior to leaving the Site. Decontamination methods will consist of scraping, brushing, and/or vacuuming to remove dirt on vehicle exteriors and wheels. If dry methods are not adequate, high-pressure washing and/or cleaning solutions should be used. Soil removed from equipment and wash water will be collected and placed into 55-gallon drums or other appropriate containers. Soil and decontamination water will be characterized and disposed of at an off-Site permitted facility.

## 5.11 DOCUMENTATION, NOTIFICATIONS, AND REPORTING

The Contractor, or its designee, will maintain a daily log of all construction activities and will also maintain copies of manifests or bills-of-lading for all soil and groundwater (both hazardous and nonhazardous) removed from the construction zone during the project. Copies of these documents will be provided to the Property Owner and the Environmental Manager for recordkeeping as well as provided in the completion report.

The Environmental Manager will document field observations during the confirmation sampling, handling, and management of the soil excavated from the Site. The Environmental Manager will also summarize the excavation activities in a Completion Report to the Owner and the Water Board if required.

If required, the following reports can be prepared for submittal to the Water Board:

- Field Reports: Field Reports allow the recipient to keep informed on Site progress, to answer queries from the public, and to update the Water Board management. These reports will include: Site name, dates for the week, summary of the week's activities, on-site visits/inspections by regulatory personnel, community communications (community concerns, inquiries, and/or communications), problems or issues encountered in accomplishing the work, deviations from the SMP, unanticipated discoveries, summary of air monitoring (with exceedances, action levels, and corrective actions), any discharges to the sanitary system, notes on Site security, planned activities for next 2-week period, documentation of conformance with BAAQMD requirements regarding VOC-affected soil, and references.
- Project Progress Reports: Briefly summarizes project management and field activities completed during the reporting period (e.g., "September 2023") with significant findings, problems identified and corrective actions, regulatory interactions, and public interactions. Similarly, includes activities planned for the upcoming reporting period (e.g., "October 2023").
- Completion Report: Provides field documentation summarizing the activities, including laboratory reports for imported soil and for wastes, manifests, bills-of-lading, transportation records, disposal records, field inspections, air monitoring data, weather data, deviations from the SMP and field change orders, corrective

actions, inspection reports, discharge reports, tailgate safety meeting records, and a photographic record of field activities.

# 6.0 LNAPL RECOVERY AND GROUNDWATER MONITORING PLAN

This section presents the general outline for LNAPL recovery and groundwater monitoring following the completion of the remedial action construction activities.

## 6.1 LNAPL RECOVERY

While the remedial action activities are expected to remove a significant portion of the remaining LNAPL on the Site, residual LNAPL may remain, which can be recovered and removed from the Site to prevent its discharge into the Bay.

### 6.1.1 Recovery Frequency

LNAPL recovery is currently occurring at a frequency of approximately one time per week. Experience at the Site has shown that recovery periods more frequently than once per week do not yield significant additional recovery.

Following completion of the remedial action construction activities, LNAPL will be recovered on a one time per week basis. This frequency will be evaluated to determine whether it should increase or decrease based on the rate at which LNAPL flows into the recovery wells.

### 6.1.2 Recovery Method

LNAPL recovery is currently conducted using oleophilic socks that are placed in the wells on the Site that have indications of LNAPL. Previously, pneumatic pumping of selected wells and collection of LNAPL was conducted; however, over time that method of recovery became less effective, hence the transition to oleophilic socks.

Oleophilic socks will be deployed at each well that has indications of LNAPL. On a regular basis (currently envisioned as once per week), the oleophilic socks will be removed from the wells, inspected, and replaced if observed to be filled with LNAPL. In wells exhibiting 1 foot or more of LNAPL, the well will be additionally bailed of the recoverable LNAPL.

### 6.1.3 Recovered LNAPL Disposition

LNAPL from oleophilic socks will be placed in the on-site dumpster that is used to receive wastes from the booming operations. LNAPL bailed from the wells will be placed in a U.S. Department of Transportation (DOT)-approved 55-gallon drum for off-site disposal once full.

### 6.1.4 Record Keeping

Field logs will be completed each time there is LNAPL recovery to document the activities conducted. Records of the activities will be filed and will be used as needed during reporting activities.

### 6.1.5 Boom Management

Currently booms in the Bay are managed three times per week. These booms consist of a combination of hard plastic booms and oleophilic booms and pads that work to contain the LNAPL that may be released to the Bay.

Boom management, maintenance, and record keeping will continue at the existing frequency but will be revisited on a regular basis to determine whether an increased or decreased frequency may be more suitable.

## 6.2 GROUNDWATER MONITORING

Following completion of the remedial action construction activities, groundwater monitoring will be conducted to monitor the efficacy of the remedial activities and monitor the progress of the monitored natural attenuation. All groundwater monitoring wells that have been installed on the Site will be monitored.

### 6.2.1 Monitoring Frequency

All groundwater monitoring wells will be sampled on a quarterly basis for the first 2 years following completion of remedial action construction activities. Following quarterly sampling, the sampling frequency will be extended to semiannually for approximately 5 years.

The frequency of monitoring may be revisited and increased or decreased based on the sampling results.

### 6.2.2 Monitoring Activity

Monitoring will consist of gauging each well using an oil-water interface probe and recording the depth to LNAPL (if present) and depth to water.

Wells that do not have measurable LNAPL or a visible sheen of LNAPL will be subsequently sampled for chemical analyses. Such wells will be purged and sampled in accordance with standard practice protocols.

### 6.2.3 Groundwater Analysis

Groundwater samples from wells not containing LNAPL will be analyzed for the following constituents:

- TPH full scan using EPA Method 8015M;
- Benzene, toluene, ethylbenzene, and xylenes using EPA Method 8260; and
- Nitrate ($NO^{3-}$), sulfate ($SO_4^{2-}$), ferrous iron ($Fe^{2+}$), ferric iron ($Fe^{3+}$), oxidation-reduction potential (ORP), dissolved oxygen.

### 6.2.4 Sample Waste Management

Groundwater purged from groundwater monitoring wells will be containerized in DOT-approved 55-gallon drums and kept on Site pending analytical results. Once results are received, the water will be properly disposed.

### 6.2.5 Reporting

A groundwater monitoring report will be prepared following each sampling event. Data trends, once established, will be evaluated to confirm remedial progress.

# 7.0 HEALTH AND SAFETY

The Contractor or the Environmental Professional is responsible for preparing a HASP for all tasks performed that require subsurface work at the Site. The HASP will provide the following information based on currently applicable legal requirements, including California Division of Occupational Safety and Health regulations without limitations:

- The health and safety considerations for the specific COCs detected or potentially present at the Site;
- PPE and monitoring requirements; and
- The physical hazards associated with the planned tasks.

A Site-specific HASP will be prepared in accordance with federal (29 CFR 1910.120), state (Title 8 CCR [8 CCR] Section 5192), and local requirements. The HASP addresses Site preparation activities, soil excavation, soil management, groundwater management, soil loading for transportation to off-Site permitted disposal facilities, backfilling, and other activities where workers might have direct contact with Site soil or groundwater.

The HASP will be made available for regulatory review and approval if needed and will be provided to the designated Contractor and construction workers for reference as part of their orientation and/or development of their own HASPs. Field personnel will be required to review the HASP and provide written acknowledgement of their review and understanding of the HASP and willingness to abide by its requirements. In addition, the Contractor's construction superintendent will perform daily tailgate safety meetings held at the beginning of each workday to discuss relevant task-specific safety issues.

The HASP will detail all planned construction activities and will describe standard safety precautions (e.g., protective gear for workers, proper soil-handling techniques). The HASP also will describe the minimum safety measures to be implemented at the Site during all activities. The Contractor or the Environmental Manager is responsible for ensuring that the safety precautions detailed in the HASP are implemented and monitored during all activities at the Site.

The Contractor or the Environmental Manager will abide by all applicable federal, state, and local regulations and codes relating to health and safety, and will adhere to all California Occupational Safety and Health Administration regulations contained in 8 CCR, as they apply to the Site activities. In conjunction with other SMP protocols discussed herein, adherence to regulations in 8 CCR will reduce risks and provide a methodology to decrease any impacts to a less than significant level. Applicable regulations may include but are not limited to the following:

- Injury and Illness Prevention Program (8 CCR 1509 and 3202);
- Hazardous Waste Operations and Emergency Response (8 CCR 5192);
- Hazard Communication (8 CCR 5194);
- Personal Protective Equipment (8 CCR 10);
- Respiratory Protective Equipment (8 CCR 5144);
- Control of Noise Exposure (8 CCR 5095 through 5100);
- Excavations (8 CCR 1503 and 1539 through 1547);
- Fire Prevention and Suppression Procedures (8 CCR 4848);
- Portable Fire Extinguishers (8 CCR 6151);
- Cleaning, Repairing, Servicing, and Adjusting Prime Movers, Machinery, and Equipment Lockout/Tagout (8 CCR 3314); and
- Medical Services and First Aid (8 CCR 3400).

# 8.0 REFERENCES

Acton Mickelson Environmental, Inc. 2009. *Updated Remedial Action Plan, GP Resources Marine Diesel Bulk Storage Facility, Former Mobil Bulk Terminal #04-394, 440 Jefferson Street, San Francisco, California.* Prepared for ExxonMobil Oil Corporation. January 15.

California Environmental Protection Agency (CalEPA) Department of Toxic Substances Control (DTSC). 2001. Information Advisory, Clean Imported Fill Material. October.

California State Water Resources Control Board. 2010. Order No. 2009-0009-dwq [as Amended by Order No. 2010-0014-dwq], National Pollutant Discharge Elimination System General Permit No. CAS000002. July 1.

CDIM Engineering. 2021. Memorandum Regarding Field Activity Summary: Hyde Street Harbor Hydrocarbon Seep. From Scott Bourne and Mary Cunningham. To Shannon Alford, Port of San Francisco. March 5.

Farallon Consulting, L.L.C. (Farallon). 2022a. *Site Investigation Report, Hyde Street Study Area, 2950 Hyde Street, San Francisco, California*. Prepared for Pilot Thomas Logistics LLC (formerly Maxum Petroleum, Inc.). February 8.

———. 2022b. Technical Memorandum Regarding Second Revised Draft LNAPL Recovery Pilot Study Summary, Hyde Street Study Area, 2950 Hyde Street, San Francisco, California. From Peter D. Jewett, Martin E. Hamann, and Matt Nusenow, Farallon. To Chris Reiner and Amanda Pease, U.S. Environmental Protection Agency. February 16.

———. 2023a. *Interim Vapor Intrusion Evaluation Report, Hyde Street Study Area, 2950 Hyde Street, San Francisco, California*. March 27.

———. 2023b. *Interim Vapor Intrusion Evaluation Report, Hyde Street Study Area, 2950 Hyde Street, San Francisco, California*. Pending.

———. 2023c. *Revised Feasibility Study and Remedial Action Plan, Hyde Street Study Area, 2950 Hyde Street, San Francisco, California*. Pending.

U.S. Environmental Protection Agency (EPA). 2022. Letter Regarding EPA's Clean Water Act Section 311 Order to Maxum Petroleum, Inc. and Pilot Thomas Logistics, LLC; U.S.

EPA Docket No. CWA-09-2021-0001. From Christopher Reiner. To Rene I. Gamboa, Lewis Brisbois. July 27.

# 9.0 LIMITATIONS

## 9.1 GENERAL LIMITATIONS

The conclusions contained in this report/assessment are based on professional opinions with regard to the subject matter. These opinions have been arrived at in accordance with currently accepted hydrogeologic and engineering standards and practices applicable to this location. The conclusions contained herein are subject to the following inherent limitations:

- **Accuracy of Information.** Farallon obtained, reviewed, and evaluated certain information used in this report/assessment from sources that were believed to be reliable. Farallon's conclusions, opinions, and recommendations are based in part on such information. Farallon's services did not include verification of its accuracy or authenticity. Should the information upon which Farallon relied prove to be inaccurate or unreliable, Farallon reserves the right to amend or revise its conclusions, opinions, and/or recommendations.
- **Reconnaissance and/or Characterization.** Farallon performed a reconnaissance and/or characterization of the Site that is the subject of this report/assessment to document current conditions. Farallon focused on areas deemed more likely to exhibit hazardous materials conditions. Contamination may exist in other areas of the Site that were not investigated or were inaccessible. Site activities beyond Farallon's control could change at any time after the completion of this report/assessment.

For the foregoing reasons, Farallon cannot and does not warrant or guarantee that the Site is free of hazardous or potentially hazardous substances or conditions, or that latent or undiscovered conditions will not become evident in the future. Farallon's observations, findings, and opinions can be considered valid only as of the date of the report.

This report/assessment has been prepared in accordance with the contract for services between Farallon and Pilot Thomas Logistics LLC, and currently accepted industry standards. No other warranties, representations, or certifications are made.

## 9.2 LIMITATION ON RELIANCE BY THIRD PARTIES

**Reliance by third parties is prohibited**. This report/assessment has been prepared for the exclusive use of Pilot Thomas Logistics LLC to address the unique needs of Pilot Thomas Logistics LLC at the Site at a specific point in time.

This is not a general grant of reliance. No one other than Pilot Thomas Logistics LLC may rely on this report unless Farallon agrees in advance to such reliance in writing. Any unauthorized use, interpretation, or reliance on this report/assessment is at the sole risk of that party and Farallon will have no liability for such unauthorized use, interpretation, or reliance.

# FIGURES

SITE MANAGEMENT, LNAPL RECOVERY, AND
GROUNDWATER MONITORING PLAN
Hyde Street Study Area
2950 Hyde Street
San Francisco, California

Farallon PN: 2609-001


REFERENCE: 7.5 MINUTE USGS QUADRANGLE SAN FRANCISCO NORTH, CALIFORNIA, DATED 2013


N

0 3,000

SCALE IN FEET

FARALLON CONSULTING

Your Challenges. Our Priority. | farallonconsulting.com

Washington
Issaquah | Bellingham | Seattle

Oregon
Portland | Baker City

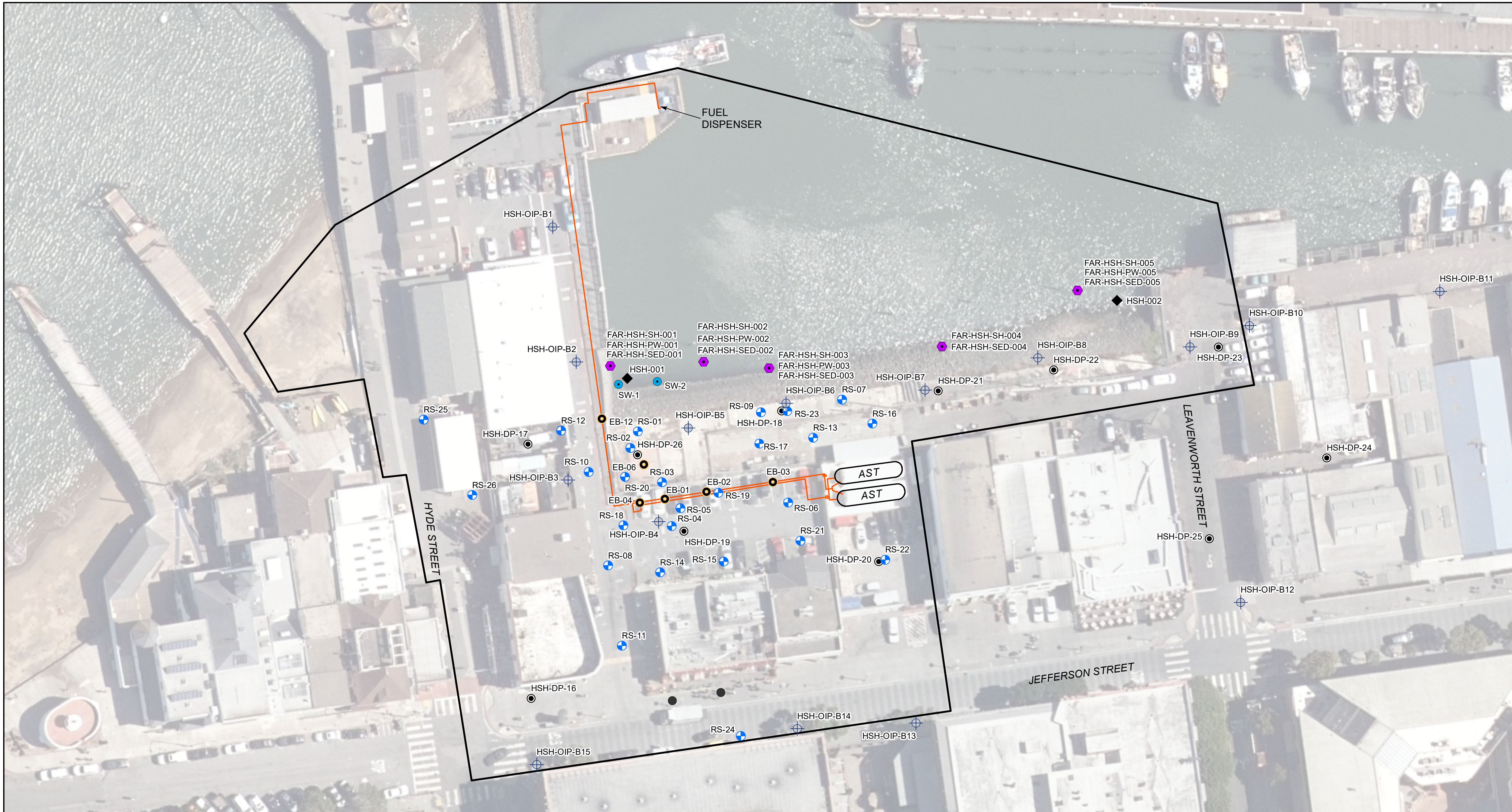
California
Oakland | Irvine

FIGURE 1

SITE VICINITY MAP
HYDE STREET STUDY AREA
SAN FRANCISCO, CALIFORNIA

FARALLON PN: 2609-001

Drawn By: chartman Checked By: MH Date: 12/9/2022 Disc Reference:
Q:\Projects\2609 Maxum Petroleum\001 Hyde St Harbor Facility\Mapfiles\027\Figure-01_SiteVicinityMap_CA.mxd




## LEGEND

- OPTICAL IMAGE PROFILER/HYDRAULIC PROFILING TOOL LOCATION (JANUARY 2021)
- ATTEMPTED BORING FOR GROUNDWATER MONITORING WELL INSTALLATION
- EXISTING MONITORING WELL
- SEDIMENT, PRODUCT, AND POREWATER SAMPLE LOCATION (JUNE 2021)
- DIRECT PUSH BORING LOCATION (FEBRUARY 2021)
- SURFACE WATER SAMPLE (ERM)
- EXPLORATORY BORING (ERM)
- SEEP SAMPLING LOCATION
- 4" MAXUM/GENERAL PETROLEUM INLET DIESEL LINE
- HYDE STREET STUDY AREA

NOTES:
1. ALL LOCATIONS ARE APPROXIMATE.
2. FIGURES WERE PRODUCED IN COLOR. GRAYSCALE COPIES MAY NOT REPRODUCE ALL ORIGINAL INFORMATION.

N

0 60

SCALE IN FEET

FARALLON CONSULTING

Washington
Issaquah | Bellingham | Seattle

Oregon
Portland | Baker City

California
Oakland | Irvine

Your Challenges. Our Priority. | farallonconsulting.com

# FIGURE 2

SITE PLAN SHOWING SAMPLING, BORING, AND MONITORING WELL LOCATIONS
HYDE STREET STUDY AREA
SAN FRANCISCO, CALIFORNIA

FARALLON PN: 2609-001

Drawn By: chartman | Checked By: MH | Date: 12/9/2022 | Disc Reference: Q:\Projects\2609 Maxum Petroleum\001 Hyde St Harbor Facility\Mapfiles\027\Figure-02_SitePlan.mxd

# APPENDIX A
# DTSC INFORMATION ADVISORY, CLEAN IMPORTED FILL MATERIAL

SITE MANAGEMENT, LNAPL RECOVERY, AND
GROUNDWATER MONITORING PLAN
Hyde Street Study Area
2950 Hyde Street
San Francisco, California

Farallon PN: 2609-001

# Information Advisory
# Clean Imported Fill Material

October 2001

**DEPARTMENT OF TOXIC SUBSTANCES CONTROL**

***It is DTSC's mission to restore, protect and enhance the environment, to ensure public health, environmental quality and economic vitality, by regulating hazardous waste, conducting and overseeing cleanups, and developing and promoting pollution prevention.***

*State of California*

*California Environmental Protection Agency*

## Executive Summary

*This fact sheet has been prepared to ensure that inappropriate fill material is not introduced onto sensitive land use properties under the oversight of the DTSC or applicable regulatory authorities. Sensitive land use properties include those that contain facilities such as hospitals, homes, day care centers, and schools. This document only focuses on human health concerns and ecological issues are not addressed. It identifies those types of land use activities that may be appropriate when determining whether a site may be used as a fill material source area. It also provides guidelines for the appropriate types of analyses that should be performed relative to the former land use, and for the number of samples that should be collected and analyzed based on the estimated volume of fill material that will need to be used. The information provided in this fact sheet is not regulatory in nature, rather is to be used as a guide, and in most situations the final decision as to the acceptability of fill material for a sensitive land use property is made on a case-by-case basis by the appropriate regulatory agency.*

## Introduction

The use of imported fill material has recently come under scrutiny because of the instances where contaminated soil has been brought onto an otherwise clean site. However, there are currently no established standards in the statutes or regulations that address environmental requirements for imported fill material. Therefore, the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) has prepared this fact sheet to identify procedures that can be used to minimize the possibility of introducing contaminated soil onto a site that requires imported fill material. Such sites include those that are undergoing site remediation, corrective action, and closure activities overseen by DTSC or the appropriate regulatory agency. These procedures may also apply to construction projects that will result in sensitive land uses. The intent of this fact sheet is to protect people who live on or otherwise use a sensitive land use property. By using this fact sheet as a guide, the reader will minimize the chance of introducing fill material that may result in potential risk to human health or the environment at some future time.

## Overview

Both natural and manmade fill materials are used for a variety of purposes. Fill material properties are commonly controlled to meet the necessary site specific engineering specifications. Because most sites requiring fill material are located in or near urban areas, the fill materials are often obtained from construction projects that generate an excess of soil, and from demolition debris (asphalt, broken concrete, etc.). However, materials from those types of sites may or may not be appropriate, depending on the proposed use of the fill, and the quality of the assessment and/or mitigation measures, if necessary. Therefore, unless material from construction projects can be demonstrated to be free of contamination and/or appropriate for the proposed use, the use of that material as fill should be avoided.

## Selecting Fill Material

In general, the fill source area should be located in nonindustrial areas, and not from sites undergoing an environmental cleanup. Nonindustrial sites include those that were previously undeveloped, or used solely for residential or agricultural purposes. If the source is from an agricultural area, care should be taken to insure that the fill does not include former agricultural waste process byproducts such as manure or other decomposed organic material. Undesirable sources of fill material include industrial and/or commercial sites where hazardous ma-

### Potential Contaminants Based on the Fill Source Area

| Fill Source: | Target Compounds |
|---|---|
| Land near to an existing freeway | Lead (EPA methods 6010B or 7471A), PAHs (EPA method 8310) |
| Land near a mining area or rock quarry | Heavy Metals (EPA methods 6010B and 7471A), asbestos (polarized light microscopy), pH |
| Agricultural land | Pesticides (Organochlorine Pesticides: EPA method 8081A or 8080A; Organophosphorus Pesticides: EPA method 8141A; Chlorinated Herbicides: EPA method 8151A), heavy metals (EPA methods 6010B and 7471A) |
| Residential/acceptable commercial land | VOCs (EPA method 8021 or 8260B, as appropriate and combined with collection by EPA Method 5035), semi-VOCs (EPA method 8270C), TPH (modified EPA method 8015), PCBs (EPA method 8082 or 8080A), heavy metals including lead (EPA methods 6010B and 7471A), asbestos (OSHA Method ID-191) |

**The recommended analyses should be performed in accordance with USEPA SW-846 methods (1996). Other possible analyses include Hexavalent Chromium: EPA method 7199*

## Recommended Fill Material Sampling Schedule

| Area of Individual Borrow Area | Sampling Requirements |
|---|---|
| 2 acres or less | Minimum of 4 samples |
| 2 to 4 acres | Minimum of 1 sample every 1/2 acre |
| 4 to 10 acres | Minimum of 8 samples |
| Greater than 10 acres | Minimum of 8 locations with 4 subsamples per location |

| Volume of Borrow Area Stockpile | Samples per Volume |
|---|---|
| Up to 1,000 cubic yards | 1 sample per 250 cubic yards |
| 1,000 to 5,000 cubic yards | 4 samples for first 1000 cubic yards +1 sample per each additional 500 cubic yards |
| Greater than 5,000 cubic yards | 12 samples for first 5,000 cubic yards + 1 sample per each additional 1,000 cubic yards |

terials were used, handled or stored as part of the business operations, or unpaved parking areas where petroleum hydrocarbons could have been spilled or leaked into the soil. Undesirable commercial sites include former gasoline service stations, retail strip malls that contained dry cleaners or photographic processing facilities, paint stores, auto repair and/or painting facilities. Undesirable industrial facilities include metal processing shops, manufacturing facilities, aerospace facilities, oil refineries, waste treatment plants, etc. Alternatives to using fill from construction sites include the use of fill material obtained from a commercial supplier of fill material or from soil pits in rural or suburban areas. However, care should be taken to ensure that those materials are also uncontaminated.

## Documentation and Analysis

In order to minimize the potential of introducing contaminated fill material onto a site, it is necessary to verify through documentation that the fill source is appropriate and/or to have the fill material analyzed for potential contaminants based on the location and history of the source area. Fill documentation should include detailed information on the previous use of the land from where the fill is taken, whether an environmental site assessment was performed and its findings, and the results of any testing performed. It is recommended that any such documentation should be signed by an appropriately licensed (CA-registered) individual. If such documentation is not available or is inadequate, samples of the fill material should be chemically analyzed. Analysis of the fill material should be based on the source of the fill and knowledge of the prior land use.

Detectable amounts of compounds of concern within the fill material should be evaluated for risk in accordance with the DTSC Preliminary Endangerment Assessment (PEA) Guidance Manual. If metal analyses are performed, only those metals (CAM 17 / Title 22) to which risk levels have been assigned need to be evaluated. At present, the DTSC is working to establish California Screening Levels (CSL) to determine whether some compounds of concern pose a risk. Until such time as these CSL values are established, DTSC recommends that the DTSC PEA Guidance Manual or an equivalent process be referenced. This guidance may include the Regional Water Quality Control Board's (RWQCB) guidelines for reuse of non-hazardous petroleum hydrocarbon contaminated soil as applied to Total Petroleum Hydrocarbons (TPH) only. The RWQCB guidelines should not be used for volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOCS). In addition, a standard laboratory data package, including a summary of the QA/QC (Quality Assurance/Quality Control) sample results should also accompany all analytical reports.

When possible, representative samples should be collected at the borrow area while the potential fill material is still in place, and analyzed prior to removal from the borrow area. In addition to performing the appropriate analyses of the fill material, an appropriate number of samples should also be determined based on the approximate volume or area of soil to be used as fill material. The table above can be used as a guide to determine the number of samples needed to adequately characterize the fill material when sampled at the borrow site.

## Alternative Sampling

A Phase I or PEA may be conducted prior to sampling to determine whether the borrow area may have been impacted by previous activities on the property. After the property has been evaluated, any sampling that may be required can be determined during a meeting with DTSC or appropriate regulatory agency. However, if it is not possible to analyze the fill material at the borrow area or determine that it is appropriate for use via a Phase I or PEA, it is recommended that one (1) sample per truckload be collected and analyzed for all compounds of concern to ensure that the imported soil is uncontaminated and acceptable. (See chart on Potential Contaminants Based on the Fill Source Area for appropriate analyses). This sampling frequency may be modified upon consultation with the DTSC or appropriate regulatory agency if all of the fill material is derived from a common borrow area. However, fill material that is not characterized at the borrow area will need to be stockpiled either on or off-site until the analyses have been completed. In addition, should contaminants exceeding acceptance criteria be identified in the stockpiled fill material, that material will be deemed unacceptable and new fill material will need to be obtained, sampled and analyzed. Therefore, the DTSC recommends that all sampling and analyses should be completed prior to delivery to the site to ensure the soil is free of contamination, and to eliminate unnecessary transportation charges for unacceptable fill material.

Composite sampling for fill material characterization may or may not be appropriate, depending on quality and homogeneity of source/borrow area, and compounds of concern. Compositing samples for volatile and semivolatile constituents is not acceptable. Composite sampling for heavy metals, pesticides, herbicides or PAH's from unanalyzed stockpiled soil is also unacceptable, unless it is stockpiled at the borrow area and originates from the same source area. In addition, if samples are composited, they should be from the same soil layer, and not from different soil layers.

When very large volumes of fill material are anticipated, or when larger areas are being considered as borrow areas, the DTSC recommends that a Phase I or PEA be conducted on the area to ensure that the borrow area has not been impacted by previous activities on the property. After the property has been evaluated, any sampling that may be required can be determined during a meeting with the DTSC.

*For further information, call Shahir Haddad, P.E. at (714) 484-5368.*