ENVIRONMENTAL SITE INVESTIGATION REPORT
Pier 70 Master Plan Area
San Francisco, California

Prepared For:
Port of San Francisco
San Francisco, California

13 January 2011
Project No. 4963.01

Treadwell&Rollo
A LANGAN COMPANY

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Mr Mark Johnson
California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, California 94612

Subject: Environmental Site Investigation Report
Pier 70 Master Plan Area
San Francisco, California

Dear Mr Johnson,

On behalf of the Port of San Francisco (Port), Treadwell & Rollo | A Langan Company submits this Environmental Site Investigation Report for the upland portion of the Pier 70 Master Plan Area in San Francisco, California. This report includes the results of the Human Health and Ecological Screening Level Risk Assessments.

Please call Dorinda Shipman at (415) 955-5262 if you have any questions.

Sincerely yours,
Treadwell & Rollo, Inc. | A Langan Company

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Acronym and Abbreviation List

ABS	absorption factor
API	American Petroleum Institute
ASTM	American Society of Testing Materials
ASTs	aboveground storage tanks
atm-m^3/mol	atmosphere-cubic meter per mole
ATSDR	Agency for Toxic Substances and Disease Registry
BAE	BAE Systems San Francisco Ship Repair
BCA	bias corrected accelerated
bgs	below ground surface
BTEX	Benzene, toluene, ethylbenzene, xylenes
C&T	Curtis & Tompkins, Ltd.
cc	cubic centimeter
CHHSLs	California Human Health Screening Levels
cm	centimeter
cm/s	centimeter per second
COPCs	contaminants of potential concern
CSFs	cancer slope factors
DNAPL	Dense Nonaqueous Phase Liquid
DNAPL	Dense Nonaqueous Phase Liquid
DQO	Data Quality Objective
DTSC	Department of Toxic Substances Control
E&E	Ecology and Environmental, Inc.
EDR	Environmental Data Resources, Inc.
EPCs	Exposure Point Concentrations
ERB	equipment rinsate blank
ERRG	Engineering/Remediation Resources Group, Inc.
ESLRA	Ecological Screening Level Risk Assessment

Acronym and Abbreviation List
(Continued)

ESLs	Regional Water Quality control Board Environmental Screening Levels
FS	feasibility study
ft	feet
ft/day	feet per day
g/mol	grams/mole
GPS	Global Positioning Satellite
HEAST	Health Effects Assessment Summary Tables
HERD	Human and Ecological Risk Division
HEW Drilling	HEW Drilling Company, Inc.
HHRA	Human Health Risk Assessment
IRIS	Integrated Risk Information System
Kp	permeability coefficient
LEL	lower explosive limit
LNAPL	light non-aqueous phase liquid
Master Plan	Pier 70 Draft Preferred Master Plan
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
ml	milliliter
MGP	manufactured gas plant
MRLs	minimal risk levels
MS	mass spectrography confirmation
MS/MSD	matrix spike/matrix spike duplicates
MSD	Matrix spike duplicates
MTBE	Methyl tert-butyl ether
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NCP	National Contingency Plan
ND	not detected

Acronym and Abbreviation List
(Continued)

NOA	naturally occurring asbestos
NOEL	no-observed-effect- level
NWIC	Northwest Information Center
OEHHA	Office of Environmental Health Hazards Assessment
OSHA	Occupational Safety and Health Administration
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyl
PID	Photoionization Detector
Port	the Port of San Francisco
PPE	personal protective equipment
PPRTVs	Provisional Peer Reviewed Toxicity Values
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
RBTCs	Risk-Based Target Concentrations
RfCs	reference concentrations
RfDs	reference doses
RME	reasonable maximum exposure
RMP	risk management plan
RSL	Regional Screening Level
RTK	Trimble Real-Time Kinematic
RWQCB	Regional Water Quality Control Board
RWQCB-SF	San Francisco Bay Regional Water Quality Control Board
SCM	Site Conceptual Model
SFDI	San Francisco Drydock Inc.
SFDPH	San Francisco Department of Public Health
SFPUC	San Francisco Public Utilities Commission
SHPO	State Historic Preservation Office
SI	Site Investigation

Acronym and Abbreviation List
(Continued)

SLC	State Lands Commission
SOPs	Standard Operating Procedures
SVOC	semi volatile organic compounds
T&R	Treadwell & Rollo, Inc.
TEF	toxic equivalency factor
TEG	TEG-Northern California Inc.
TEQ	toxicity equivalents
TOC	Total organic carbon
TPH	total petroleum hydrocarbons
TPHCWG	Petroleum Hydrocarbon Criteria Working Group
TPHd	total petroleum hydrocarbons as diesel
TPHg	total petroleum hydrocarbons as gasoline
TPHmo	total petroleum hydrocarbons as motor oil
UEL	upper explosive limit
URFs	unit risk factors
USA	Underground Service Alert
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USTs	underground storage tank
VOCs	volatile organic compounds
Water Board	San Francisco Bay Regional Water Quality Control Board
WHO	World Health Organization
Work Plan	*Site Investigation Work Plan for the Pier 70 Master Plan Area, San Francisco California* (T&R, 2009)
WSA	William Self Associates
µg/L	micrograms per liter
2,3,7,8-TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin

ENVIRONMENTAL SITE INVESTIGATION REPORT
PIER 70 MASTER PLAN AREA
San Francisco, California

ES.1 INTRODUCTION

Treadwell & Rollo, Inc | A Langan Company (T&R) prepared this Site Investigation (SI) Report (SI Report) to present the results of the SI conducted in the upland portion of the Pier 70 Master Plan Area (Site) in San Francisco, California (Figure ES-1) for the Port of San Francisco (Port). The purpose of the SI was to identify and collect the data needed to support a risk assessment, evaluate potential remedies and mitigation measures, and develop a risk management plan (RMP) to be implemented during and after Site redevelopment. The SI focused on the upland portion of the Site and assessed soil gas, soil, and groundwater impacts. It does not include assessment of hazardous building materials or offshore sediment impacts. This SI Report includes a Human Health Risk Assessment (HHRA) and an Ecological Screening Level Risk Assessment (ESLRA). The SI was performed in general accordance with the *Site Investigation Work Plan for the Pier 70 Master Plan Area, San Francisco California* (Work Plan) prepared by T&R, dated 29 October 2009, and approved by the San Francisco Bay Regional Water Quality Control Board (Water Board) in a letter dated 15 October 2009. This SI Report presents findings and recommendations regarding the potential impacts of contamination on Site redevelopment and was prepared with oversight by the Water Board and the San Francisco Department of Public Health (SFDPH).

The Pier 70 Master Plan Area (Figure ES-2) is located on the eastern shoreline of San Francisco at Potrero Point (a continuation of serpentinite-based Potrero Hill) and is roughly bounded by 22nd Street to the south, Illinois Street to the west, and San Francisco Bay to the north and east. The Site encompasses approximately 69 acres and is largely underlain by fill material placed seaward of the San Francisco historic shoreline (Figure ES-2) between the late 1800s to early 1900s. The original shoreline was comprised of serpentinite bluffs overlooking mud flats that extended into San Francisco Bay. Much of the land that now makes up the Site was constructed by blasting the serpentinite hills of Potrero Point (Port of San Francisco, 2009a) and placing the resultant rock in the Bay to create new land along the shoreline.

ES.2 BACKGROUND

Since the 1890s, the area has been used for the manufacture, maintenance, and repair of marine vessels by companies including Union Iron Works, Bethlehem Steel, Todd Shipyards, Risden Iron Works, Southwest Marine, SF Drydock, and the US Navy. During World Wars I and II, Bethlehem Steel was one of the largest producers of destroyers and submarine ships. Operations at the Site have included administration and engineering offices, metal foundries, galvanizing shops, warehouses, paint shops, plating shops, powerhouses including boilers and transformers, dry docks, lumber and steel lay down yards, and ship docking slips and piers (T&R, 2007).

Recent land use has included metals recycling, car crushing and storage, ship repair, and warehousing. Currently, the largest tenant at the Site is BAE Systems San Francisco Ship Repair (BAE), which currently operates a dry dock and ship repair facility on approximately 15 acres of the Site (Figure ES-3). The second largest tenant is Auto Return, which provides towing and car return services for City of San Francisco (Figure ES-3). Other tenants include various storage and warehousing operations, and Sim's metals, a scrap metal yard. Approximately two-thirds of the Site is covered by buildings, pavement, or gravel, with some portions of the Site including weedy patches of vegetation. The shoreline consists of rock or rubble riprap or piers on pilings that extend out over the open water.

This Site is largely located bayward of San Francisco's historic shoreline (Figures ES-2 and ES-3). Previous investigations of properties bayward of the 1852 shoreline have found fill material with elevated levels of metals and petroleum hydrocarbons as a result of the 1906 earthquake and fire. The Pier 70 site is like many sites along San Francisco's waterfront that are comprised primarily of fill material, some of which contains contaminants that exceed California state criteria for hazardous waste and will require special handling and disposal. In accordance with the requirements of San Francisco Health Code Article 22A, a site mitigation and health and safety plan will also be required before construction or off-haul of fill material to designated landfills.

The results of this SI are intended to support redevelopment of the Site in accordance with the *Pier 70 Preferred Master Plan* (Master Plan, Port of San Francisco, 2010). The Master Plan envisions a redevelopment program that meets the following goals:

- Reuse and rehabilitate maritime historic structures to be recognized in the National Register Historic District;
- Create new shoreline parks and open space;
- Integrate commercial and residential development, and shoreline open space with the existing ship repair and dry dock industry; and

- Develop a land use plan that will respect historic character as well as promote economic development.

The Master Plan divided the Site into Parcels 1 though 9, and into four parks including Crane Cove Park, Slipways Park, Irish Hill and Central Plaza Park (Figure ES-4)[1].

ES.3 OBJECTIVES

The objectives of the SI are to:

- Update the initial Site Conceptual Model (SCM) using SI data;
- Collect and analyze soil gas, soil, and groundwater samples to provide chemical concentration data needed to support the HHRA, ESLRA, and FS;
- Collect soil chemical concentration data required by Article 22A to estimate hazardous waste soil volumes that could require special handling and disposal at designated landfills; and,
- Identify and collect the data needed to develop a RMP to be implemented during Site redevelopment.

ES.4 POTENTIAL SOURCE AREAS

Potential source areas of environmental concern have been identified based on the historic operations described above and more recent land uses documented for Pier 70. Contaminants of potential concern (COPCs) are either naturally-occurring constituents or contaminants introduced into environmental media (i.e. soil, soil gas, groundwater) by site construction or site use that pose a potential for adverse impact to people, plants, animals, or the environment. Shipbuilding, maintenance and repair operations on Pier 70 that are considered potential contaminant source areas include: metal foundries, galvanizing shops, machinery warehouses, plating shops, power generating facilities (boiler rooms and transformers), planning mills, flange shops, and steel yards. Various environmental investigations have been conducted at the Site to address different objectives including characterization of areas for future land use development, regulatory compliance requirements, and source-specific characterization and delineation of known areas of contamination. Potential source areas are illustrated on Figure ES-5. Contamination

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[1] The SI used the August 2009 draft Master Plan definition of Parcels 1 through 8, with a ninth parcel comprising the ship repair area. As finalized in April 2010, the Master Plan grouped these eight into four parcels. See Exhibit 2 to the Pier 70 Preferred Master Plan, April 2010.

associated with the former manufactured gas plant (MGP) operations at the Potrero Power Plan site located south of Pier 70 has migrated north and appears to be present beneath portions of Parcel 8 and Slipways Park. PG&E is currently investigating the extent of MGP-related contaminants in the area (AMEC, 2010). Soil and groundwater in the impacted area contain polycyclic aromatic hydrocarbons (PAHs), benzene, toluene, ethylbenzene, xylenes (BTEX), petroleum hydrocarbons, and metals.

Previous soil and groundwater investigation results were compared to Regional Water Quality Control Board (Water Board) Commercial and Residential Environmental Screening Levels (ESLs) for both soil and groundwater (Water Board, 2008, Table B). Groundwater results were also compared to vapor intrusion ESLs (Water Board, 2008, Table E-1). The historical data comparison to ESLs indicated that metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), PAHs, polychlorinated biphenyls (PCBs), pesticides, and total petroleum hydrocarbons (TPH) are present, in some instances at concentrations that exceed ESLs.

ES.5 SITE CONCEPTUAL MODEL

Results from previous investigations, conducted prior to this SI found metals, TPH, PAHs, and PCBs in subsurface soil. Metals, TPH, PAHs, and VOCs have also been detected in groundwater. Soil gas samples had not been collected previously. The likely sources of these COPCs are the historic Bay fill material, former fuel use and storage, and shipbuilding and other industrial operations previously conducted at the Site. Chemicals may have been placed during Bay infilling, spilled at the ground surface or released in the subsurface soil and leached to shallow groundwater. Based on this previous information, an initial SCM was developed and presented in the Work Plan to understand the potential sources of contamination, COPCs, potentially affected media (soil, soil gas, and groundwater), and transport and exposure pathways that could potentially impact human or ecological receptors. The SCM synthesizes what is known to date into a snapshot that communicates the Site physical setting and COPC release or exposure mechanisms. Based on the findings of this SI, the initial SCM was updated and the current SCM is presented in Figure ES-6.

ES.6 REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are media-specific (soil gas, soil, and groundwater) goals for protecting human health and the environment consistent with future land use described in the Master Plan which include commercial and limited residential land use.

COPCs in soil gas include VOCs and methane. The soil gas RAOs for protection of human health include:

- Prevent or minimize future site users' exposure to VOCs in soil gas exceeding appropriate screening levels through inhalation of VOCs volatilized from the subsurface into outdoor air.
- Prevent or minimize future site users' exposure to VOCs in soil gas exceeding appropriate screening levels through inhalation of VOCs volatilized from the subsurface into indoor air.
- Prevent or minimize construction workers' exposure to methane in trenches or excavations at concentrations exceeding 5% of the lower explosive limit (LEL) or 15% of the upper explosion limit (UEL).
- Prevent or minimize future site users' exposure to methane via migration through building foundations into indoor air.

The follow RAOs apply to soil:

- Prevent or minimize human (commercial, recreational or residential site users, construction workers) and ecological receptors' contacting, ingesting, or inhaling contaminated soil and dust.
- Prevent or minimize COPCs from leaching from soil into groundwater.

The following RAOs apply to groundwater:

- Prevent COPC-contaminated groundwater from migrating into the San Francisco Bay.
- Protect ecological and recreational human receptors in the San Francisco Bay from ingestion of or dermal contact with contaminated groundwater.
- Prevent or minimize human (commercial, recreational or residential site users, construction workers) inhalation of VOCs (exceeding appropriate screening levels) that have volatilized from groundwater into outdoor or indoor air.

Groundwater at the Site is not considered a potential future source of drinking water. As a result, risk to human health through the drinking water exposure pathway was not evaluated in the HHRA. No RAOs were developed for ecological receptor exposure to soil gas because there is little potential for significant exposure or impact to plant or animals from soil gas.

ES.7 SITE INVESTIGATION APPROACH

The SI sampling was conducted using an iterative approach in two phases. Phase 1 was conducted to identify the presence of contamination in the potential source areas, and to close data gaps that exist for parcels at the Site where no environmental investigations have been conducted. Phase 2 was conducted to further delineate the nature and lateral and vertical extent of contamination found during Phase 1, and to collect sufficient data to complete the HHRA, ESLRA, waste characterization, FS and RMP. The sampling results were used to assess the presence or absence of COPCs in soil, soil gas and groundwater at each potential source area and to characterize subsurface conditions across the Site.

T&R conducted Phase 1 activities during August through November 2009. Phase 1 activities included pre-investigation permitting and underground utility clearance; advancement of 62 exploratory borings and six test pit excavations; soil and grab groundwater sampling; installation, development and surveying of eight monitoring wells, groundwater monitoring well gauging and sampling; groundwater level fluctuation evaluation; soil gas sampling at 24 locations, and installation and sampling of six semi-permanent soil gas monitoring probes (Figure ES-7).

T&R reviewed the Phase 1 sampling results with the Port and Water Board and prepared a Work Plan addendum dated 24 November 2009 describing the proposed Phase 2 investigation. The Water Board reviewed and approved the Phase 2 Work Plan addendum in the letter dated 7 December 2009.

Phase 2 activities were performed during December 2009 through April 2010. Phase 2 activities included pre-investigation permitting and underground utility clearance; advancement of 30 exploratory borings and four test pit excavations; soil, grab groundwater, and non-aqueous phase liquid (NAPL) sampling; installation of two additional monitoring wells; gauging and sampling 13 monitoring wells; and soil gas sampling at nine locations. Phase 1 and 2 sampling locations are shown on Figures ES-7 and ES-8, respectively. The soil sampling program was designed to evaluate subsurface conditions by obtaining detailed lithologic descriptions of soil and rock encountered during drilling, collecting soil samples for geotechnical parameter testing, and collecting soil samples at sufficient depths and extent to define the lateral and vertical extent of contaminants exceeding ESLs.

The groundwater sampling program included collection of grab groundwater samples, and the installation and sampling of monitoring wells to evaluate groundwater conditions at the Site. Soil and grab groundwater sampling results were evaluated to determine where monitoring wells should be installed.

During Phase 1, eight groundwater monitoring wells were installed, developed, and sampled to further characterize potential impacts. Two additional monitoring wells were installed during Phase 2 at locations chosen based upon evaluation of Phase 1 and 2 investigation results. The 10 monitoring wells installed as part of this investigation were sampled during Phase 2 along with three pre-existing wells: two located in Crane Cove Park (GWDG3 and GWDG4) and one located in Slipways Park (MW-28A) as shown on Figure ES-8.

The soil gas sampling program was designed to evaluate the potential for vapor intrusion into buildings proposed for Site redevelopment. Soil gas probes that can be used for repetitive soil gas sampling were installed in former demolition debris and fill disposal areas to collect data required for closure in accordance with State regulations for disposal facilities. To assess appropriate soil gas sampling and soil gas probe installation depths, groundwater levels in two monitoring wells (CCMW-01 and SPMW-01) located near the shoreline were continuously monitored over one full tidal cycle to evaluate groundwater level fluctuation and choose appropriate soil gas sampling and soil gas probe installation depths.

T&R modified some activities or sampling locations proposed in the Work Plan based upon field conditions, and conducted investigation activities in addition to those proposed in the Work Plan, including collecting additional shallow soil samples (0 to 10 feet below ground surface, excavating test pits in Crane Cove Park, observing AMEC Geomatrix' (AMEC's) dense non-aqueous phase liquid (DNAPL) investigation at Slipways Park related to former MGP operations and sampling soil from borings advanced by AMEC. Field methodologies, sampling procedures, analytical plan, and data quality objectives are described in detail in Section 4 of the SI Report along with additional activities and deviations from the Work Plan.

ES.8 SITE INVESTIGATION RESULTS

The Site physical setting; subsurface conditions; soil gas, soil, and groundwater analytical results and screening level exceedances; and non-aqueous phase petroleum hydrocarbons observed in soil and groundwater are detailed in Section 5 of the SI Report and summarized below. A boring completion summary is presented on Figure ES-9 and indicates early refusal at boring locations in the southwest portion of the Site where bedrock is present within 4 feet of the ground surface. Early refusal was also met in Parcel 1 at P1SB-01 due to the presence of concrete, and in Parcel 9 at P9SB-03 likely due to the presence of subsurface riprap that comprises the sea wall. Figure ES-9 also indicates locations where oily residue was observed in soil, and where NAPL consisting of heavy degraded petroleum hydrocarbons was present in groundwater. The area of investigation for potential impacts from former MGP operations at the adjacent Potrero Power Plant site is also shown on Figure ES-9.

Soil

TPH in shallow soil exceeds ESLs at a small number of locations within each Parcel with the exception of Parcel 7 (Figure ES-10). TPH exceedances are likely associated with fill material and localized releases from historic above and underground fuel storage tanks, historic shipbuilding or industrial activities. In deep soil, TPH exceeding ESLs is limited to Parcel 9 and Slipways Park (Figure ES-11). The deep soil TPH contamination in Slipways Park and Parcel 9 is likely associated with the former MGP located south of Slipways Park, and aboveground and underground storage tank (AST/UST) releases, respectively.

The PAH ESL exceedances are ubiquitous and laterally discontinuous in shallow soil (Figure ES-12), and are likely associated with contaminants present in Bay fill material. In deep soil, PAHs exceeding ESLs are limited to Parcels 8 and 9 and the southern end of Slipways Park (Figure 13). The deep soil PAH contamination in Parcels 8 and 9 is primarily associated with the former MGP and AST/UST releases, respectively.

In shallow soil, metals including arsenic, cadmium, chromium, copper, lead, mercury, vanadium, and zinc are present throughout the Site at concentrations exceeding ESLs (Figure ES-14). Many of those (arsenic, cadmium, copper, chromium, nickel, vanadium, and zinc) are components of serpentine bedrock present beneath the Site and in the fill material. Localized areas of elevated metal concentrations may be associated with historic shipbuilding and industrial activities such as plating welding or metal fabrication. Metal ESL exceedances in deep soil are limited (Figure ES-15) and are likely associated with Bay fill material and serpentine bedrock.

Asbestos was present in some soil samples at low levels (between 1% and 2%). Concentrations of naturally-occurring asbestos in soil at the Site are related to the native serpentine rock in the fill material rather than to contamination from hazardous materials formerly used at the Site.

Soil was analyzed for characteristics used determine waste classification, which would apply to any soil removed from the Site for off-site disposal. In shallow soil, metals are present at levels that would be regulated under California Hazardous Waste criteria in areas indicated on Figure ES-16. At approximately 20 percent of the soil sampling locations, if removed from the Site, the soil would be classified as

California-regulated hazardous waste due to total or soluble metals concentrations. None of the shallow soil sample results exceeded federal criteria for classification as hazardous waste; the remainder would be non-hazardous None of the samples of deeper soil (greater than 10 feet bgs) would be characterized as state or federally-regulated hazardous waste.

Groundwater

TPH was reported above ESLs in grab groundwater samples collected from Crane Cove Park, Parcel 9, Parcel 4, and Central Plaza Park, and are likely associated with the presence of TPH in fill material from historic industrial operations (Figure ES-17). Heavily degraded petroleum hydrocarbons were present in soil in borings at Parcel 9, and at Parcel 4 near the former UST/AST fuel storage area east of Building 113. TPH exceedances were not reported above ESLs in any of the monitoring wells with the exception in TMW-28A in Slipways Park. At Slipways Park, TPH exceedances are likely associated with the former MGP located to the south.

PAH exceedances were reported in grab groundwater samples collected from Crane Cove Park, Parcel 9, Parcel 2, Parcel 4 and Central Plaza Park (Figure ES-18). The PAH exceedances in grab groundwater samples are likely associated with the leaching of PAHs from fill material, localized releases from former aboveground and underground fuel storage tanks, historic shipbuilding or industrial activities, and the presence of NAPL in soil borings at Parcel 9. PAH exceedances are limited to two monitoring wells only (one at Crane Cove Park and one at Slipways Park). PAH exceedances at these locations are likely associated with leaching of PAH contaminated fill material at former slipways, and, in Slipways Park, the former MGP located to the south.

Dissolved and total metals in groundwater exceeded ESLs in Parcels, 1, 2, 3, 6, 8 and 9 and in Crane Cove, Central Plaza and Slipways parks (Figure ES-19). The metals in groundwater are likely associated with the Bay fill material and with historic industrial activities such as plating and welding and metal fabrication.

Non-Aqueous Phase Liquid (NAPL)

A mixture of degraded petroleum hydrocarbons is present as NAPL in soil and as globules in groundwater within a portion of Parcel 9. The lateral extent of potential NAPL appears to be approximately 350 feet wide and 800 feet long (Figure ES-20). During the field investigation, visible hydrocarbon staining was observed in soil in P9SB-01, P9SB-02, P9SB-03, P9SB-05, P9SB-07, P9SB-08, P9SB-09A, P9SB-09B/P9MW-03, P9SB-12, and P9SB-13. Visible heavily degraded NAPL was observed in groundwater samples from P9SB-04/P9MW-02, P9SB-06/P9MW-01, P9SB-07, P9SB-09A, P9SB-10, and P9SB-11.

The vertical extent of NAPL in soil appears to extend from the shallowest depth at which it was encountered, six feet below ground surface (bgs) in boring P9SB06, to a maximum of nine feet bgs in boring P9SB-04/P9MW-02. NAPL was typically observed as globules near the top of groundwater in borings P9SB-04/P9MW02, P9SB-09A, P9SB-06/P9MW-01, P9SB-07, and P9SB-11. NAPL was also observed during the installation and well development activities of monitoring wells P9MW-01 and P9MW-02. However, NAPL has not been observed during purging and groundwater sampling activities. This degraded oily material is not present in sufficient quantity to form a separate phase or continuous layer floating on the groundwater.

The physical properties of the NAPL (discussed in detail in Section 5.2.6 of the SI Report) indicate that the NAPL in Parcel 9 is nonvolatile, insoluble, highly viscous, and essentially immobile. Evaluation of the mobility of the NAPL, including composition, specific gravity, interfacial tension, and percent pore saturation in soil, indicates that the NAPL in Parcel 9 will not migrate into the Bay. Sampling results from monitoring wells installed at the Bay margin indicate that NAPL is not present, consistent with the conclusion that NAPL is not migrating to the shoreline.

Soil Gas

Soil gas impacts at the Site are minimal with the following two exceptions. At Parcel 2, benzene exceeds the residential ESL at one location north of Building 36. The source of benzene at this location is uncertain and benzene was not detected at elevated concentrations in groundwater. At Parcel 8, naphthalene exceeds the residential ESL at one location. The source of the naphthalene may be PAHs in the fill material related to the former MGP south of Parcel 8.

Methane was not present at the Site at concentrations exceeding California state regulations (Title 27) or explosive limits. The maximum methane concentration detected at the Site is 1,200 µg/L at semi-permanent vapor probe P6SGP-01. This maximum methane level is equal to 0.183%, well below the 1.25% for protection of indoor air quality in overlying structures, and well below the 5% LEL limits in Title 27.

ES.9 HUMAN HEALTH RISK ASSESSMENT RESULTS

The purpose of the HHRA was to evaluate potential human exposures and health risks associated with construction during redevelopment and anticipated future land use, with current Site conditions at Pier 70, and to identify areas within the Site that require mitigation in support of decision-making regarding future construction and property development. Numerous investigations were conducted at the Pier 70 Site to characterize the nature and extent of chemicals in groundwater and soil. The data collected as part of this SI, as well as the applicable historical investigation data provide the basis for the HHRA.

Based upon the planned future uses at the Site, potentially exposed populations include residents (adults and children), commercial workers (including retail, commercial and industrial workers), park visitors (adults and children) and construction workers. These future site users could be exposed to soil (through ingestion, dermal contact, and dust inhalation), soil gas (through inhalation of volatile constituents in indoor and outdoor air) and groundwater (construction workers only, during subsurface construction such as trenching or excavation).

To assess risk in future land uses scenarios posed by residual chemicals in soil, soil gas, and groundwater at the Site were within acceptable risk ranges based on future land uses, risks were estimated using calculated Exposure Point Concentrations (EPCs) for each chemical in each media, and back-calculating risks for each receptor on a parcel-by-parcel basis. In the Feasibility Study, Risk-Based Target Concentrations (RBTCs) for the applicable media and receptor will be compared to residual chemical concentrations to guide remedial decisions during Site redevelopment. RBTCs represent the concentration of a chemical that can remain in the soil, soil gas, or groundwater and still be protective of human health for future land uses.

For evaluating potential cancer risk associated with exposure to contaminants, a lifetime incremental increase in cancer risk in the range of $1x10^{-6}$ to $1x10^{-4}$ is generally considered to be acceptable[2]. These values correspond to one additional cancer case in 10,000 people ($1x10^{-4}$) and one additional case in one-million people ($1x10^{-6}$) above the baseline lifetime cancer risk. The $1x10^{-6}$ risk level is generally used as a point of departure for considering if remedial measures should be taken at a site. With a risk of $1x10^{-4}$ or greater, an evaluation of remedial measures is required. When risks fall in the range of $1x10^{-6}$ to $1x10^{-4}$ (often referred to as the "risk management range") as whether a response action is warranted

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[2] USEPA, 1990. "National Oil and Hazardous Substances Pollution Contingency Plan." Federal Register Volume 55, No. 46, p. 8,666. 9 April.

and will be made on a case by case basis. For noncancer health impacts risk is expressed as a Hazard Index (HI), which is an indicator of the probability of potential risk of noncancer adverse health effects. A HI less than 1 is generally considered acceptable risk; a HI greater than 1 requires evaluation for potential risk management measures[3].

As part of the site investigation and risk assessment at Pier 70, cancer risks and noncancer hazard indices (HIs) were calculated for each parcel and estimated for future receptors based on future redevelopment plans. At Parcels 1 and 3, future development plans are for residential or commercial uses. Total lifetime cancer risks for the resident and commercial worker were within the risk management range of $1x10^{-6}$ to 1×10^{-4}. Noncancer HIs were less than one for the adult resident and commercial worker at Parcel 1, but higher than 1 at Parcel 3. The noncancer HIs for the child resident were greater than the target HI of 1 at Parcels 1 and 3. Noncancer HIs greater than 1 for residents (both the adult and child) and commercial workers are attributable to the incidental ingestion of metals in soil.

For the parcels slated for future commercial development (1 through 8, and the former MGP subsurface investigation area (MGP investigation area)[4]), total lifetime cancer risks were generally within the risk management range of 1×10^{-6} to 1×10^{-4} for the future commercial scenario, except at Parcel 4. At Parcel 4, total cancer risk for the commercial worker was 2×10^{-4}, exceeding the upper end of the risk management range. The cancer risk was mainly attributable to dermal contact with and incidental ingestion of arsenic and benzo(a)pyrene in soil. At Parcel 4, arsenic was present at elevated concentrations at two locations (G-47-EE2000 and G-48-EE2000) in the 0 to 0.5 feet bgs depth interval. Removal of these two arsenic concentrations from the dataset used to calculate the EPC decreases the calculated total lifetime cancer risk by an order of magnitude. Therefore, it is anticipated that if these soils are removed during site development, total cancer risk will be in the risk management range of 1×10^{-6} to 1×10^{-4}. Commercial worker HIs were at or less than 1 at most parcels (Parcels 1, 4, 5, 6, 7, 8, and the MGP investigation area) and slightly greater than 1 at Parcels 2, 3, and 9. Elevated HIs at these parcels were due to incidental ingestion of metals in soil. No single chemical exceeded an HI of 1.

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[3] USEPA, 1989. "Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part A)." Interim Final. Office of Emergency and Remedial Response. EPA-540/1-89/002. Washington, D.C. December.

[4] The highest concentrations of PAHs, BTEX, petroleum hydrocarbons, and metals are found in the eastern half of Parcel 8 and the southern portion of Slipways Park, and are qualitatively and quantitatively different from the nature and extent of contamination present throughout the rest of these parcels. Consequently, a separate exposure area was designated in the HHRA and referred to as the "MGP Investigation Area".

Total cancer risks for park visitors at Central Plaza Park, Crane Cove Park, and Slipways Park were within the risk management range of 1×10^{-6} to 1×10^{-4}. For adult park visitors, all HIs were below 1. For the child park visitor HIs were 1 at Central Plaza Park and greater than 1 at Crane Cove Park and Slipways Park. The cancer risk drivers at the parks were primarily incidental ingestion of and dermal contact with metals and PAHs (mainly benzo(a)pyrene) in soil. At Central Plaza Park, the arsenic EPC of 11 mg/kg is comparable to the arsenic soil background concentration of 11.5 mg/kg established for the adjacent Potrero Power Plant site (AMEC, 2009). Without the inclusion of arsenic in the risk calculations, total cancer risk was in the 1×10^{-6} risk range. Noncancer HIs greater than 1 were attributable to the incidental ingestion of metals in soil.

For the construction worker, estimated cancer risks were within the risk management range of 1×10^{-6} to 1×10^{-4} at all parcels evaluated except at the MGP investigation area. At the MGP investigation area, risk to the construction worker was 3×10^{-4}, greater than the upper end of the risk management range. The primary risk drivers at the MGP investigation area were PAHs, primarily benzo(a)pyrene in soil, through the incidental ingestion and dermal contact routes of exposure. Construction worker HIs were greater than 1 at all parcels except Parcel 8, where the HI was equal to 1 though limited data were available and results may have been influenced by the small data set. Elevated HIs at the majority of parcels were due to inhalation of metals on particulates and incidental ingestion of metals in soil.

For all potentially-exposed populations, most of the total cancer risk at the Pier 70 Site is attributable to exposure to COPCs in shallow soil. The cancer risk attributable to inhalation of VOCs in soil gas, through migration of soil gas to indoor or outdoor air, was less than 1×10^{-6} for all parcels evaluated, and for almost all site users: residents, commercial workers, and recreational park visitors, with the exception of Parcel 4. At Parcel 4 the cancer attributable to VOCs in soil gas was 1×10^{-5} , based on benzene and ethylbenzene results from a 1997 duplicate grab groundwater sample. For all parcels, TPH and VOCs in soil gas contributed no noncancer risk to commercial and residential receptors (HIs less than 1).

Future construction workers at the Pier 70 Site will be subject to the highest cancer risks from exposure to metals and PAHs in soil and groundwater during site redevelopment. However, occupational exposure to chemicals is regulated under CalOSHA and it is expected that workers will be required to wear personal protective equipment during dust-generating activities such as excavation and trenching and to prevent potential contact with groundwater that has infiltrated into excavations. Dust control measures will be implemented as required by federal, state, and local regulations, thus further reducing worker exposure to chemicals on particulates.

Grading, importing soil and new construction will cover or remove and replace surface soil, thereby greatly reducing exposures to existing Site soils in the landscaped areas of the future commercial, multi-family residential, and open space/park developments. The rest of the Site will be paved or covered with buildings, thus eliminating any direct contact with surface soil. A RMP will provide specifications and details as to how risk will be mitigated and managed during construction within the Pier 70 Site. Following Site development, direct contact with surface soil is not likely for residents, outdoor commercial workers, and recreational visitors.

ES.10 ECOLOGICAL SCREENING LEVEL RISK ASSESSMENT

The ESLRA conducted as part of this site investigation and risk assessment followed a conservative approach, and identified whether the Site could pose a potential ecological risk. The ESLRA concludes that the potential exists for unacceptable risk to terrestrial organisms from several contaminants present on Pier 70. Numerous metals exist in concentrations above ecological screening levels, and therefore, these metals pose a potential risk to terrestrial ecological receptors. Total cyanide and some dissolved metals occur at concentrations in groundwater that pose a potential risk to aquatic life should they migrate to the Bay.

Pyrene is the only PAH to pose a potential risk to terrestrial ecological receptors. No furans, dioxins or VOCs are present in sufficient amounts to be considered a potential ecological risk. PCBs (Aroclors 1254 and 1260) and TPH pose a potentially unacceptable risk to terrestrial ecological receptors. The only organic constituents concluded to potentially pose an unacceptable risk to aquatic life in the Bay via the migration of groundwater are PAHs and TPH.

In its current state, Pier 70 provides limited habitat for terrestrial wildlife and plants. Most of the Site is paved or contains buildings. The open space to be created in Central Plaza Park, Crane Cove Park, and Slipways Park may enhance the Site's attractiveness to wildlife that might occur along the waterfront. New open space development will include landscaping, to varying extent depending on the purpose and design of the different parks, and may include native plants. However, new park construction will also include paving and covering ground surface, and will likely require replacement of existing surface soil with imported soil to support new landscaping. Once redevelopment is complete, most of the Site will be paved or covered, eliminating plants' and animals' exposure to Site soil, thereby minimizing potential risks.

ES.11 SUMMARY AND CONCLUSIONS

This environmental site investigation at Pier 70 characterized upland Site conditions, and the HHRA and ESLRA identified potential health risks that contamination could pose to future Site users. The risk assessment findings do not suggest significant potential for risk to current site occupants or visitors, or a need for soil or groundwater remediation that would substantially, adversely impact the feasibility of future development as envisioned in the Master Plan.

Soil at the Site is typical of Bay fill deposits: It contains naturally-occurring asbestos and heavy metals, as well as introduced metals, PAHs, TPH, and PCBs. Shallow soil in some areas exhibits characteristics of California-regulated hazardous waste (Figure ES-16). Metals, including arsenic, cadmium, chromium, copper, lead, mercury, vanadium, and zinc are present in soil throughout the Site at concentrations exceeding ESLs. Naturally-occurring asbestos and most of the metals (arsenic, cadmium, copper, chromium, nickel, vanadium, and zinc) are components of serpentine bedrock present beneath the Site and in the fill material. Concentrations of these constituents found in soil at Pier 70 are likely to be significantly attributable to the presence of native serpentine rock in the fill material rather than primarily attributable to contamination from hazardous materials formerly used at the Site. The concentrations of metals found in soil at Pier 70 are within the range of those found in fill soils throughout Port or other filled land, such as the Oakland Army Base, Eastshore State Park, and Mission Bay area. PAHs are also ubiquitous in soil at Pier 70 at concentrations commonly found in Bayshore fill. PAHs are associated with a wide variety of industrial operations and are the primary component of MGP waste.

VOCs in groundwater and soil gas are generally below applicable ESLs established for evaluating risk of vapor intrusion into indoor air, if buildings exist or are constructed over contaminated land.

A mixture of degraded petroleum hydrocarbons is present as NAPL in soil and as globules in groundwater within a portion of Parcel 9 (Figure ES-20). This material is not present in sufficient quantity to form a separate or continuous layer floating on the groundwater. It is not volatile or soluble in groundwater, as evidenced by the absent or low concentrations of dissolved TPH, VOCs, and PAHs in groundwater samples, and negligible concentrations of VOCs in soil gas samples collected in the vicinity. The physical properties of the NAPL measured as part of this SI, including composition, specific gravity, interfacial tension, and percent pore saturation in soil, indicate that the NAPL in Parcel 9 is nonvolatile, insoluble, highly viscous, and essentially immobile. Sampling results from monitoring wells installed at the Bay margin indicate that NAPL is not present, consistent with the conclusion that NAPL is not migrating to the shoreline.

Soil and groundwater in the southeast portion of Pier 70, adjacent to the Potrero Power Plant have elevated concentrations of PAHs in shallow soil within 0 to 10 feet below ground surface. Pacific Gas and Electric (PG&E) is investigating environmental impacts associated with MGP operations formerly located at the adjacent Potrero Power Plant and also provided results from soil borings that they advanced within the Pier 70 Site. Those samples contained extremely high concentrations of PAHs, which increased with depth. The highest concentrations were found in the deepest samples, at 20 feet bgs. PG&E's assessment of the extent that DNAPL that has migrated onto Port property is ongoing and PG&E plans additional investigation of the extent of DNAPL impacts at Pier 70.

The HHRA evaluated potential human exposures and health risks associated with current Site conditions at Pier 70, and identified areas within the Pier 70 property that require mitigation during future construction and property development. The highest risks identified were to construction workers from exposure to metals and PAHs in soil and groundwater during site development activities. For other receptors, risk is within the acceptable risk range, or exposure pathways are incomplete. Following Site development, direct contact with surface soil is not likely for residents, commercial workers, and recreational visitors. Future site cover, i.e. hardscaped buildings, roads, sidewalks and/or soil cover including landscaping and parks, will eliminate key exposure pathways at the Site.

The ESLRA evaluated the need for additional site-specific ecological risk assessment and/or mitigation of potential ecological risk. The ESLRA was limited to the upland portion of the Site and did not evaluate potential impact to offshore habitat. Potential risks to terrestrial organisms result from exposure to pyrene, PCBs, and TPH in shallow soil. As discussed above for human receptors, future Site development will generally mitigate exposure to shallow soil. Potential risks to marine organisms from exposure to cyanide and dissolved metals in groundwater were also identified, though the estimate of risks associated with contaminant migration to the Bay may be overly conservative. To fully assess ecological risks offshore, groundwater impacts must be considered in conjunction with an offshore biological survey and surface water and sediment quality.

The next step in the Pier 70 Environmental Investigation process will be to evaluate remediation and mitigation of potential health risks. This evaluation will consider potentially applicable remediation alternatives with respect to effectiveness in achieving cleanup goals, consistency with development objectives, cost, and duration. Potentially feasible remedies may include engineering controls (e.g. removing, replacing, or capping soil) to reduce potential risks and institutional controls (e.g. deed restrictions, soil management measures) to manage potential health risks. A risk management plan will provide specifications and details on how risk will be mitigated and managed during future construction, operation and maintenance.

EXECUTIVE SUMMARY
FIGURES

Base map: The Thomas Guide
San Francisco County
1999

0 1/4 1/2 Mile
Approximate scale

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

Treadwell&Rollo

SITE LOCATION MAP

Date 09/27/10	Project No. 4963.01	Figure ES-1

V:\Graphics\Trgraphics\4900's\4963.01\Site Location Map.ai

Legend

- 🟦 Parcel Boundary
- 🟥 Pier 70 Site Area
- — Road Edge
- ⬚ Building
- – – Approximate 1869 Shoreline

Notes:

1. Digital orthophotos from California Spatial Information Library (CASIL) UC Davis, *ca.* 2005, http://archive.casil.ucdavis.edu/casil/.
2. Site boundary, parcels, and acreages from ROMA Design Group, Draft Preferred Pier 70 Master Plan, 17 July 2009.
3. Approximate 1869 Shoreline based upon Board of Tidelands Commissioners, *Map of the Salt Marsh and Tide Lands and Lands Lying Under Water South of Second Street and Situate in the City and County of San Francisco*, 1869.
4. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

0 150 300 600
Feet

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

SITE PLAN

Date 9/14/2010	Project 4963.01	Figure ES-2

Treadwell&Rollo

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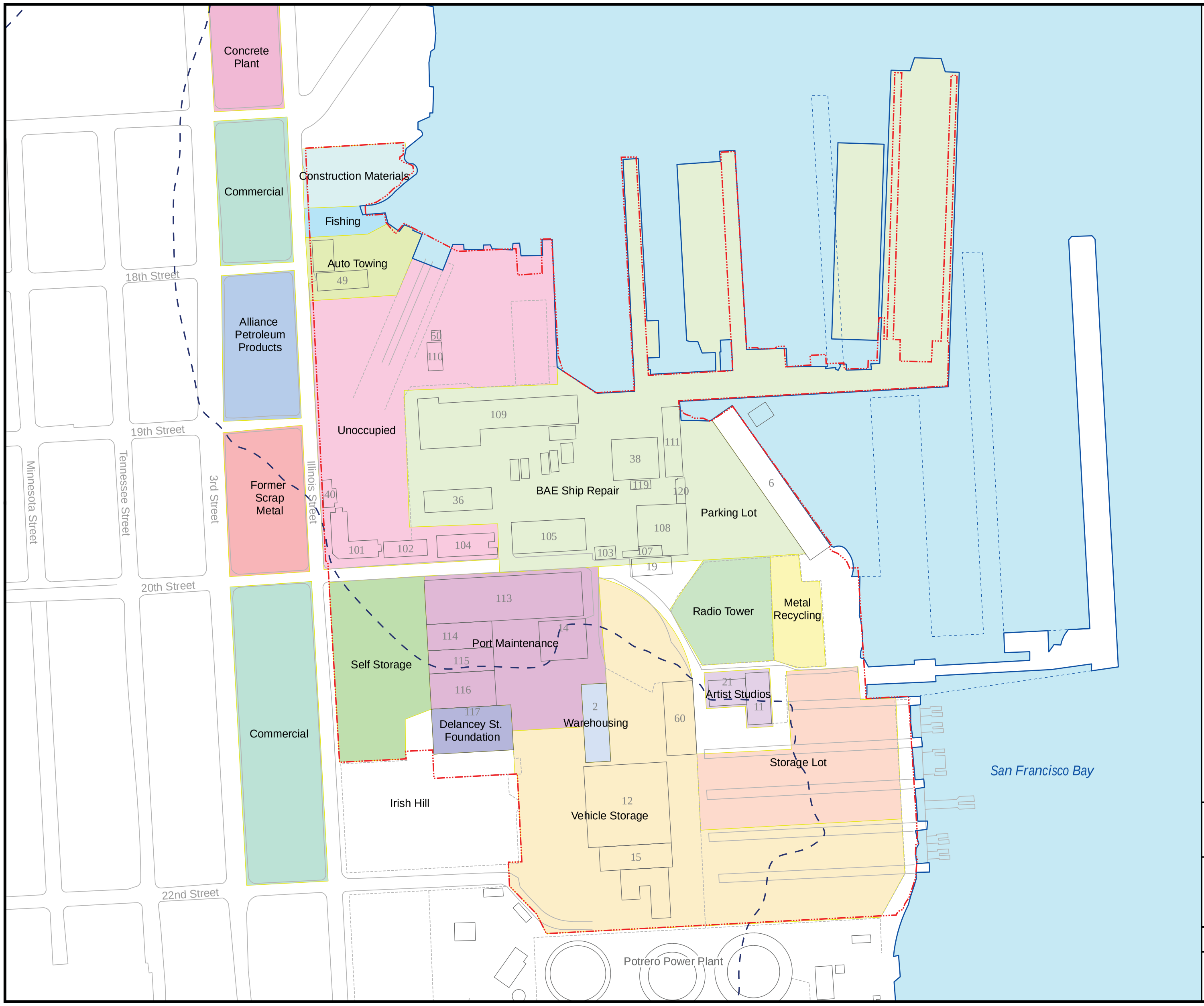

Legend

- Approximate 1869 Shoreline

Surface Feature

- Fence
- Other
- Road Edge
- Building
- Pier 70 Site Area

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
2. Current and recent historical shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/ website/sfshare/catalog/sfshoreext.zip.
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4. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

0 150 300 600

Feet

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

CURRENT LAND USE

Date 1/11/2011	Project 4963.01	Figure ES-3

Treadwell&Rollo

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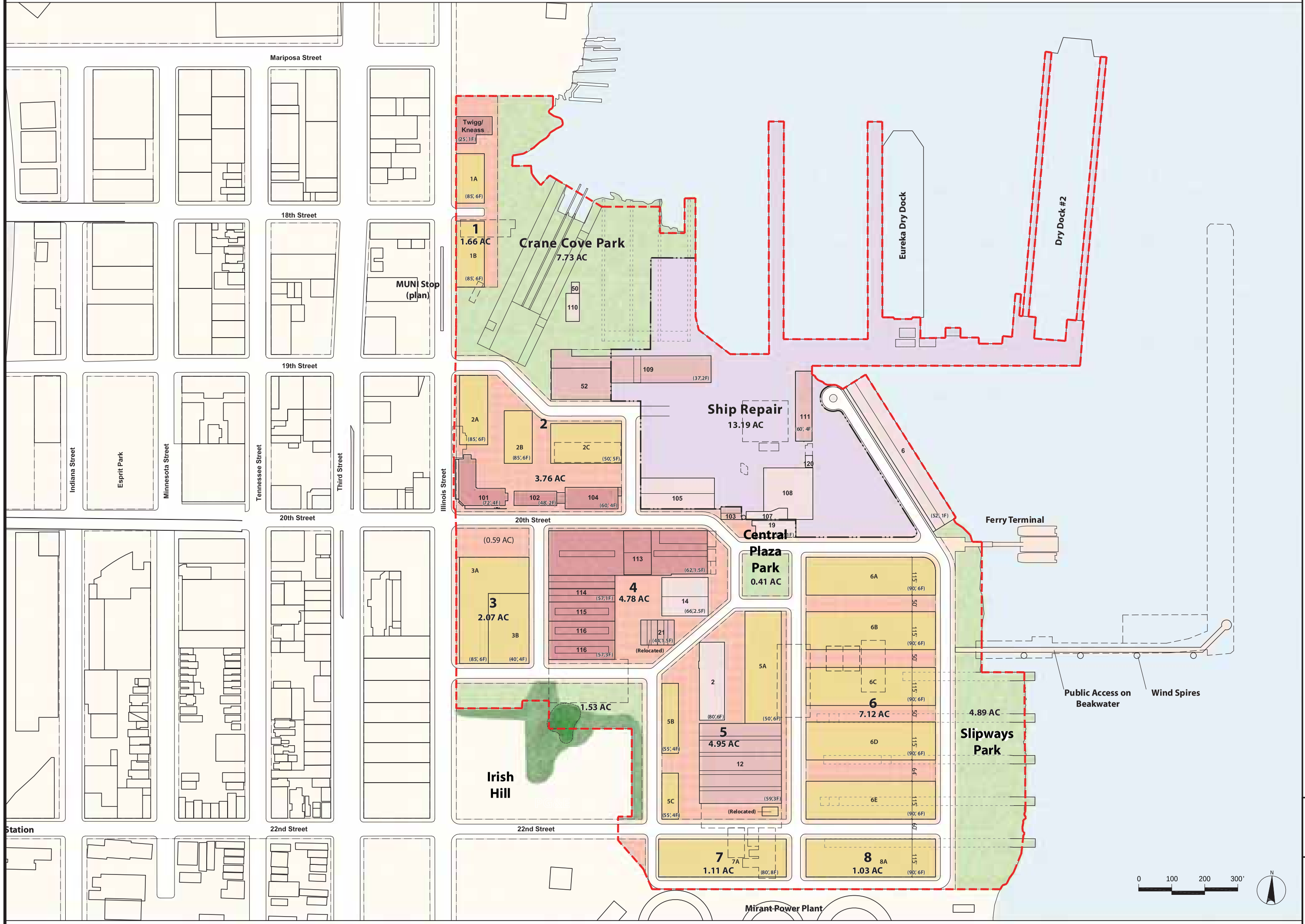

Legend

🟥 Very Significant Resource
🟥 Significant Resource
🟥 Contributing Resource
🟩 Open Space
🟪 Ship Repair
☐ Contributing Building Removed
🟨 New Building Pads

☐ Pier 70 Total Site Area	65.32 AC
🟪 Ship Repair	13.19 AC
🟥 Historic Building Footprints*	6.34 AC (276,100 SF)
🟨 New Building Pads	12.11 AC (527,200 SF)
▨ Streets	11.08 AC
🟩 Parks, Plazas and Pedestrian Ways	22.60 AC

* Not including inside Ship Repair and Crane Cove Park

Source:
ROMA Design Group and Associated Consultants,
Pier 70 Draft Preferred Master Plan, 17 July 2009.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

MASTER PLAN

Date 5/27/2010 | Project 4963.01 | Figure ES-4

Treadwell&Rollo

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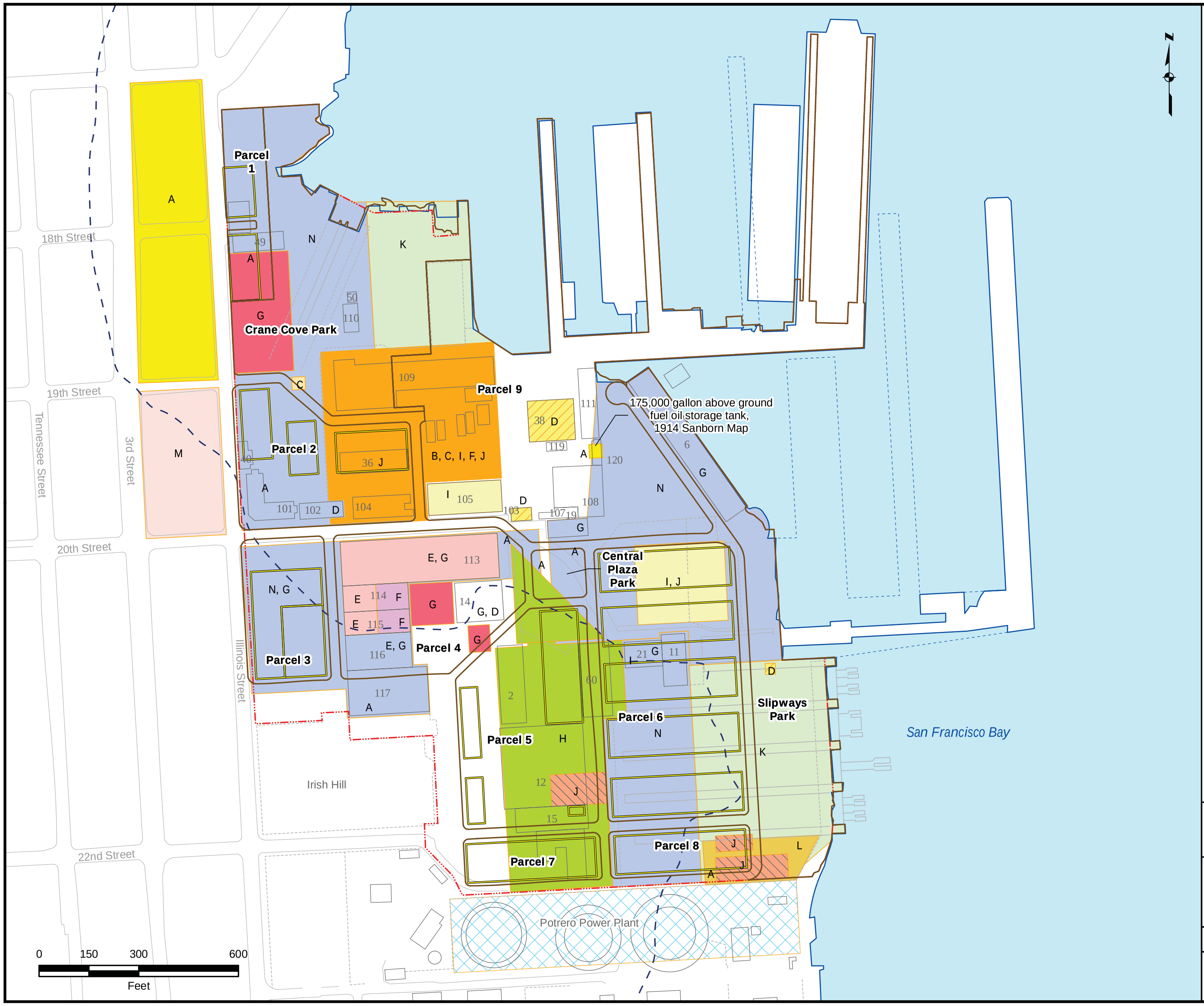

Legend

Surface Feature

- Fence
- Other
- Road Edge
- Approximate 1869 Shoreline
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)

Potential Source Area

- A, UST/AST Fuel Storage
- B, Paint Shop
- C, Galvanizing
- D, Powerhouse (Boiler/Transformer)
- E, Machine Shop
- F, Foundry
- G, Hazardous Waste Storage
- H, Machine Shop/Auto Wrecking
- I, Metal Fabrication/Substation
- J, Plating/Welding
- K, Filled Slipways
- L, Historical Manufactured Gas Plant Investigation Area
- M, Metals Recycling
- N, Bay Fill with PAHs, Metals, and Asbestos
- O, Power Plant
- Multiple Source Areas. See Descriptions Above.

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
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4. Historical Manufactured Gas Plant Subsurface Investigation Area taken from AMEC Geomatrix , *Report of Results: Subsurface Investigation Activities Evaluation of Impact ot Fill and Bay Mud, Potrero Power Plant*, Figure 2, September 2010.
5. Site boundary and parcels from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
6. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

POTENTIAL SOURCE AREAS

Date 1/10/2011	Project 4963.01	Figure ES-5

Treadwell&Rollo

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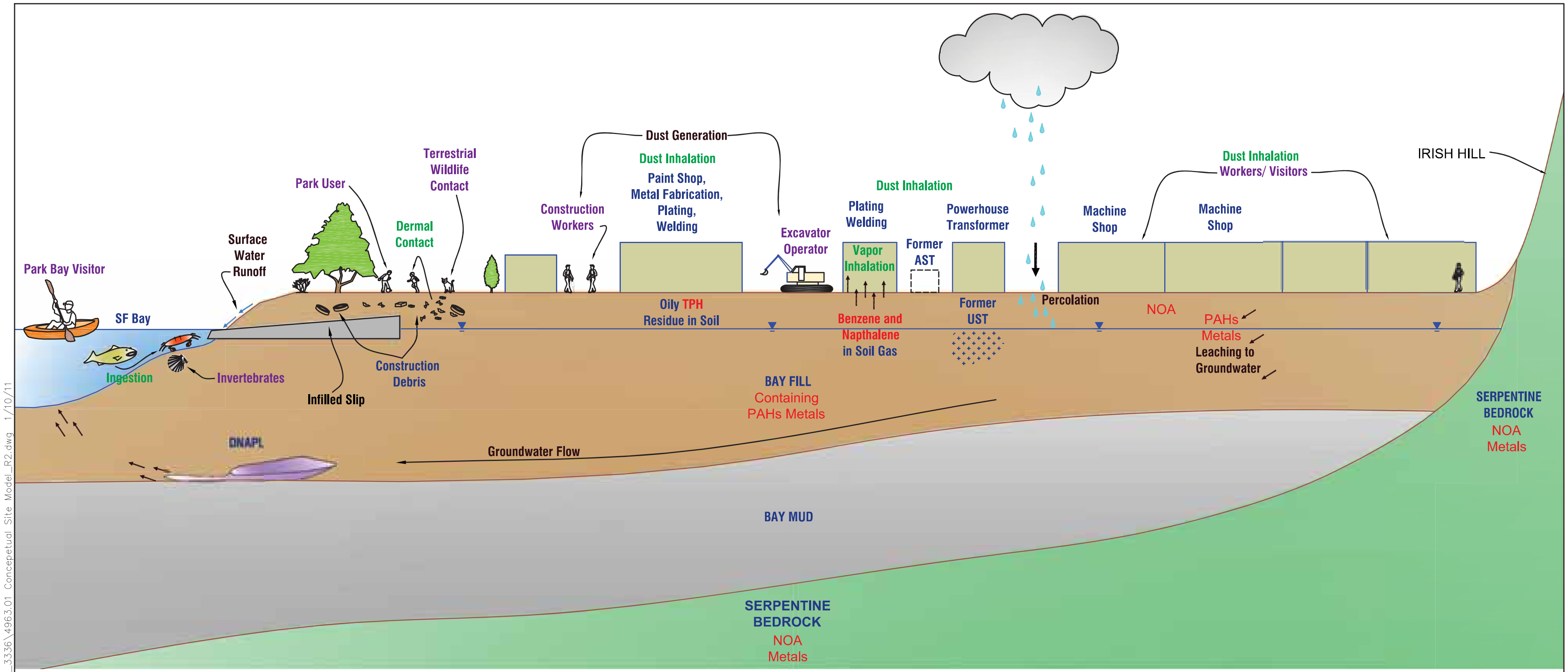

EXPLANATION

COPCs:	Contaminants of potential concern
NOA	Naturally occurring asbestos
PAHs	Polycyclic aromatic hydrocarbons
VOCs	Volatile organic compounds
PCBs	Polychlorinated biphenyls
TPH	Total petroleum hydrocarbons
⁘	Heavily degraded highly viscous petroleum hydrocarbons
⬬	Dense non-aqueous phase liquid (DNAPL)

↑ ↑ ↑	Soil vapor
B36	Building number
▼	Water table
←	Groundwater flow
▨	Building

Receptors

Source

Exposure Pathway

Exposure Media and Release Mechanism

NOT TO SCALE

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

UPDATED SITE CONCEPTUAL MODEL

Date 10/05/10	Project No. 4963.01	Figure ES-6

Treadwell&Rollo

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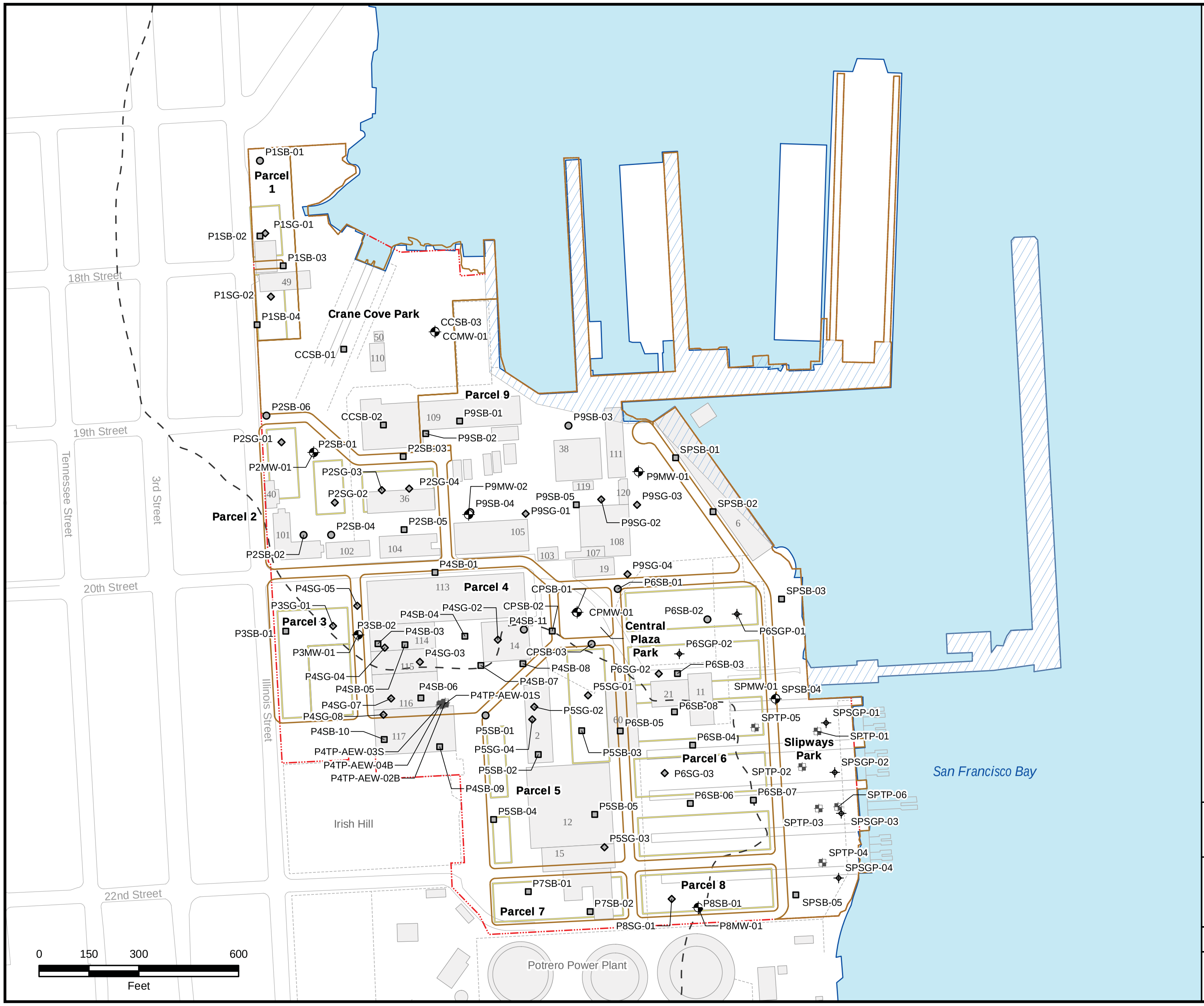

Legend

Sample Location
- ⯁ Monitoring Well
- ▪ Soil
- ◇ Soil Gas
- ● Soil and/or Grab Groundwater
- ✦ Soil Gas Probe
- ▨ Test Pit

Surface Feature
- Fence
- Other
- Road Edge
- — — Approximate 1869 Shoreline
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
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4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

PHASE 1 SAMPLING LOCATIONS

Date 9/30/2010	Project 4963.01	Figure ES-7

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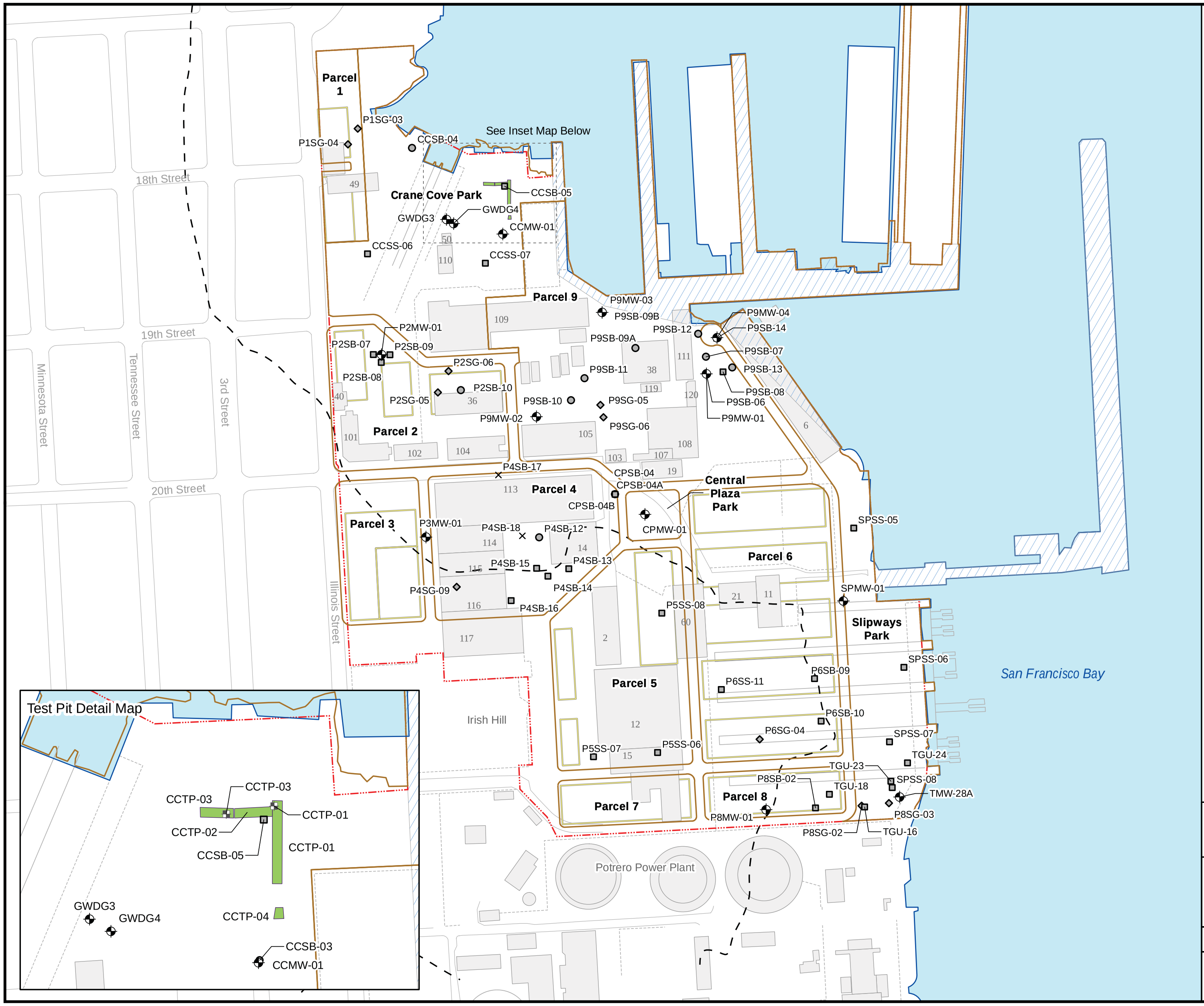

Legend

Sample Location
- ⌖ Monitoring Well
- ■ Soil
- ◆ Soil Gas
- ● Soil and or Groundwater
- × Geotechnical Boring

Surface Feature
- - - Fence
- — Other
- — — Approximate 1869 Shoreline
- — Road Edge
- ▨ Building
- ▭ Proposed Building
- ▭ Pier 70 Site Area
- ▭ Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water
- 🟩 Test Pit Extent

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
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PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

PHASE 2 SAMPLING LOCATIONS

Date 10/5/2010 | Project 4963.01 | Figure ES-8

Treadwell&Rollo

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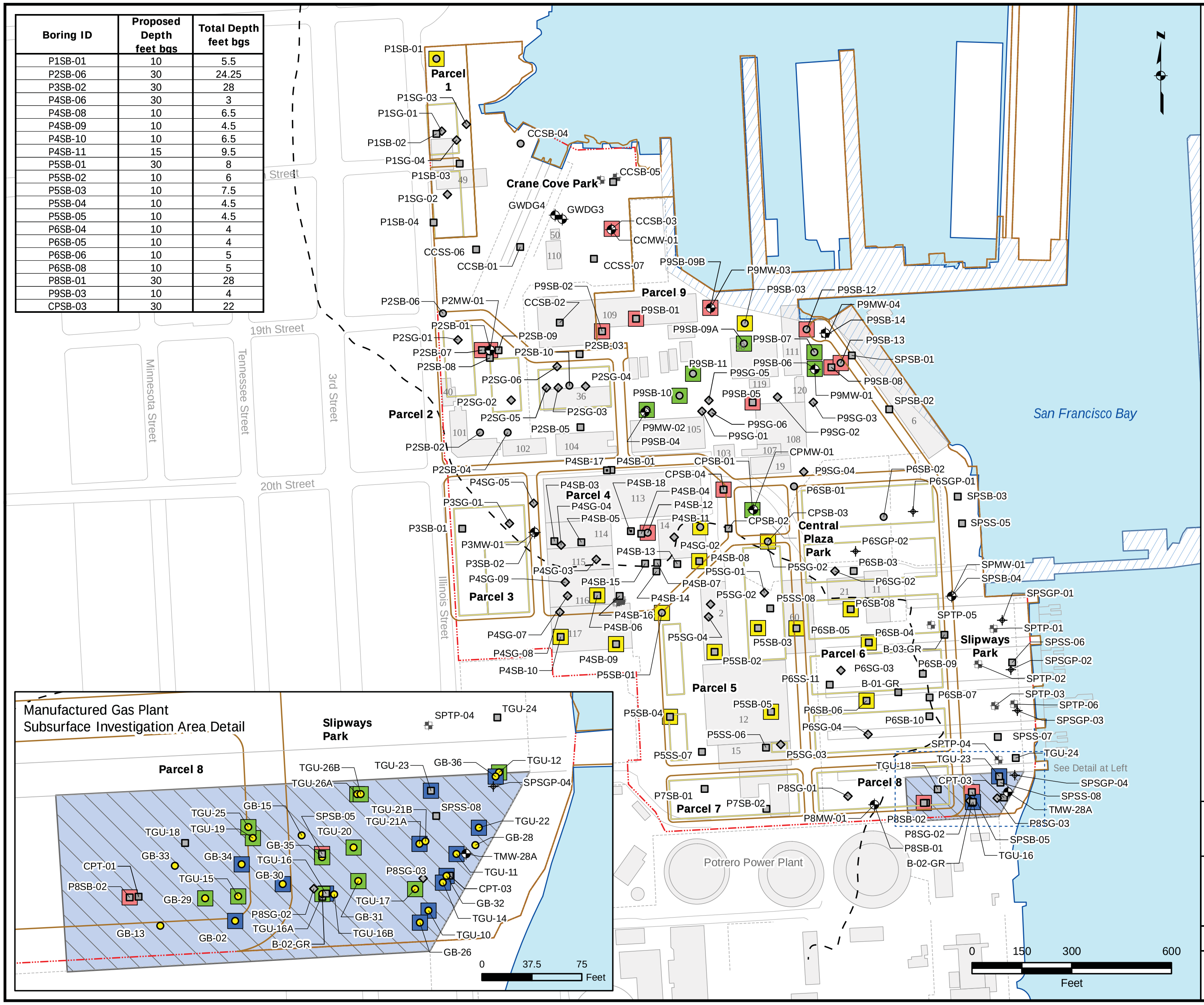
Boring ID	Proposed Depth feet bgs	Total Depth feet bgs
P1SB-01	10	5.5
P2SB-06	30	24.25
P3SB-02	30	28
P4SB-06	30	3
P4SB-08	10	6.5
P4SB-09	10	4.5
P4SB-10	10	6.5
P4SB-11	15	9.5
P5SB-01	30	8
P5SB-02	10	6
P5SB-03	10	7.5
P5SB-04	10	4.5
P5SB-05	10	4.5
P6SB-04	10	4
P6SB-05	10	4
P6SB-06	10	5
P6SB-08	10	5
P8SB-01	30	28
P9SB-03	10	4
CPSB-03	30	22



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Legend

Sample Location
- ◈ Monitoring Well
- ▣ Geotechnical Boring
- ■ Soil
- ○ Soil and or Groundwater
- ◇ Soil Gas
- ✦ Soil Gas Probe
- ▨ Test Pit

Boring Completion Summary
- 🟨 Early Refusal
- 🟥 Oily Residue Observed in Soil
- 🟩 Non-Aqueous Phase Liquid Present
- 🟦 Dense Non-Aqueous Phase Liquid Present
- – – Approximate 1869 Shoreline

Surface Feature
- Fence
- Other
- Road Edge
- ▨ Historical Manufactured Gas Plant Subsurface Investigation Area
- ▭ Building
- ▭ Proposed Building
- ▭ Pier 70 Site Area
- ▭ Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water
- ● Soil Borings from Amec, 2009 and 2010

Notes:

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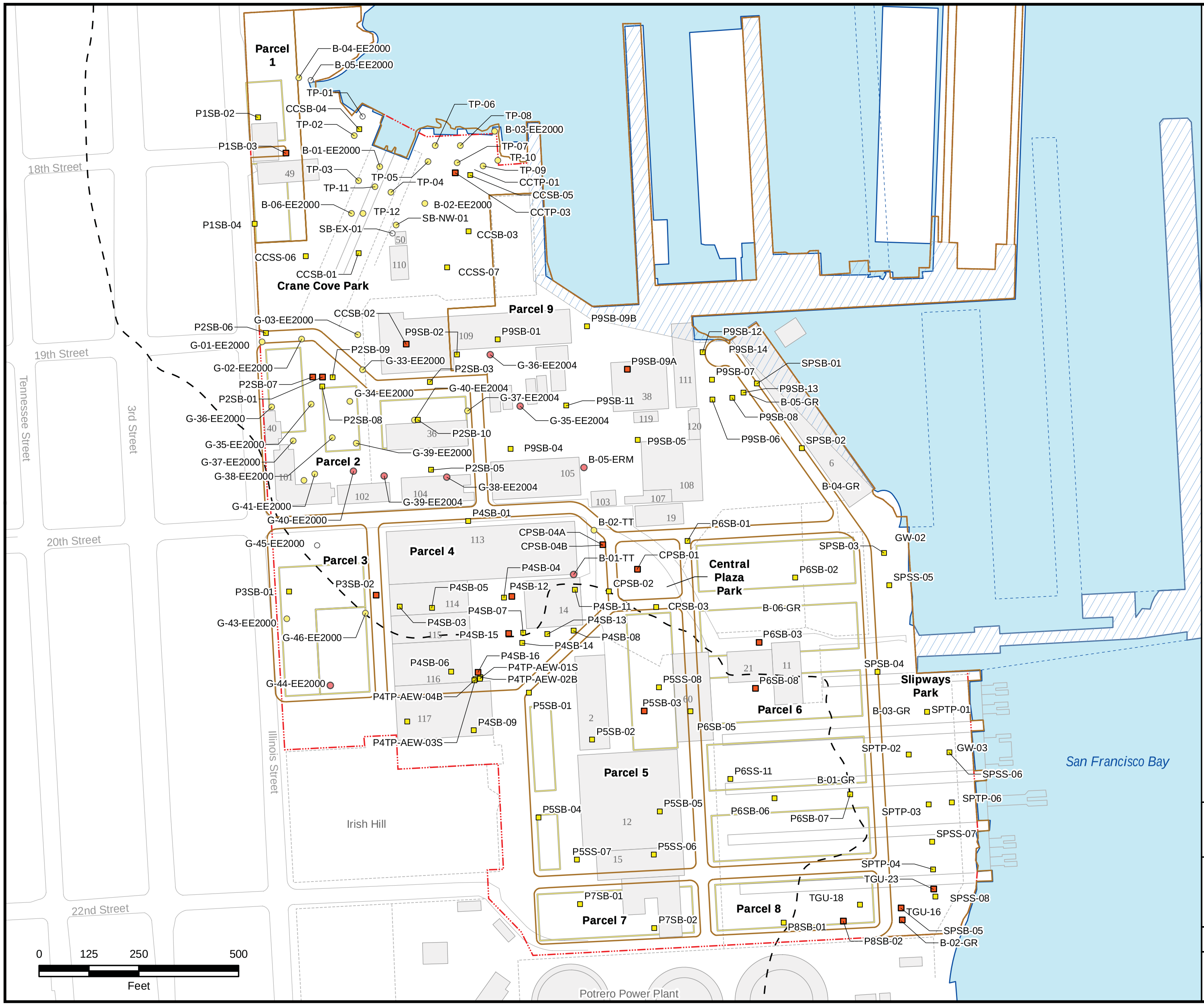
4. Site boundary and parcels from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Historical Manufactured Gas Plant Subsurface Investigation Area and additional sample points taken from AMEC Geomatrix , *Report of Results: Subsurface Investigation Activities Evaluation of Impact to Fill and Bay Mud, Potrero Power Plant*, Figures 2 and 19, September 2010.
6. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

BORING COMPLETION SUMMARY

Date 10/12/2010	Project 4963.01	Figure ES-9

Treadwell&Rollo



Legend

Historical Sample Location
- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location
- ■ Detected Below ESL
- ■ Exceedance of ESL

Surface Feature
- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

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4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

TPH RESULTS AND ESL EXCEEDANCES IN SHALLOW SOIL (0-10 FEET)

Date 9/15/2010 | Project 4963.01 | Figure ES-10

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-050.mxd

Legend

Historical Sample Location
- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location
- □ Not Detected
- ■ Detected Below ESL
- ■ Exceedance of ESL

Surface Feature
- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
2. Current and recent historical shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/ website/sfshare/catalog/sfshoreext.zip.
3. Approximate 1869 Shoreline based upon Board of Tidelands Commissioners, *Map of the Salt Marsh and Tide Lands and Lands Lying Under Water South of Second Street and Situate in the City and County of San Francisco*, 1869.
4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

TPH RESULTS AND ESL EXCEEDANCES IN DEEP SOIL (>10 FEET)

Date 9/30/2010 | Project 4963.01 | Figure ES-11

Treadwell&Rollo

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Legend

Historical Sample Location
- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location
- ▫ Not Detected
- ▪ Detected Below ESL
- ■ Exceedance of ESL

Surface Feature
- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
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4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

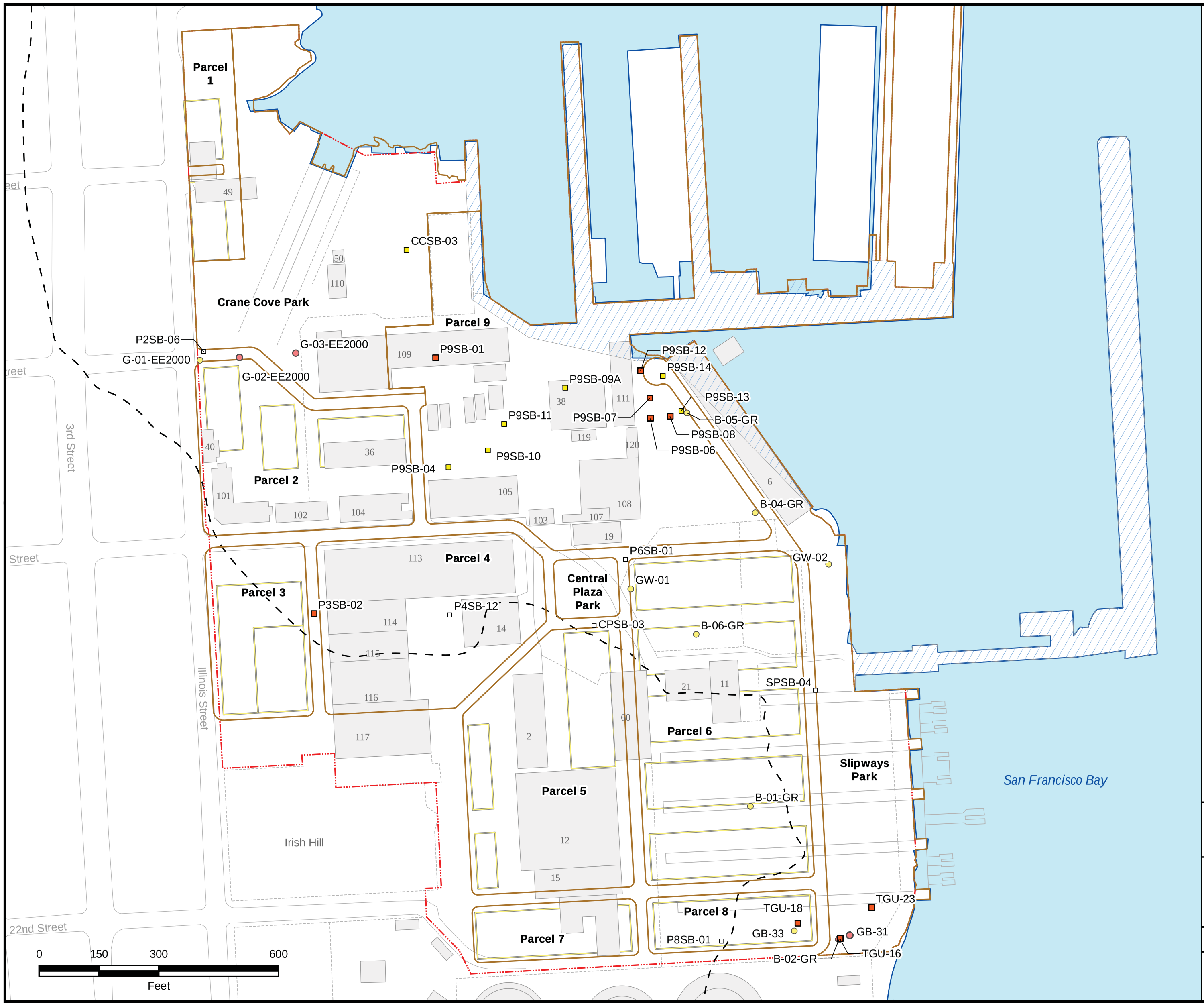
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

PAH RESULTS AND ESL EXCEEDANCES IN SHALLOW SOIL (0-10 FEET)

Date 9/15/2010	Project 4963.01	Figure ES-12

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-051.mxd



Legend

Historical Sample Location

- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location

- □ Not Detected
- ■ Detected Below ESL
- ■ Exceedance of ESL

Surface Feature

- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
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4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

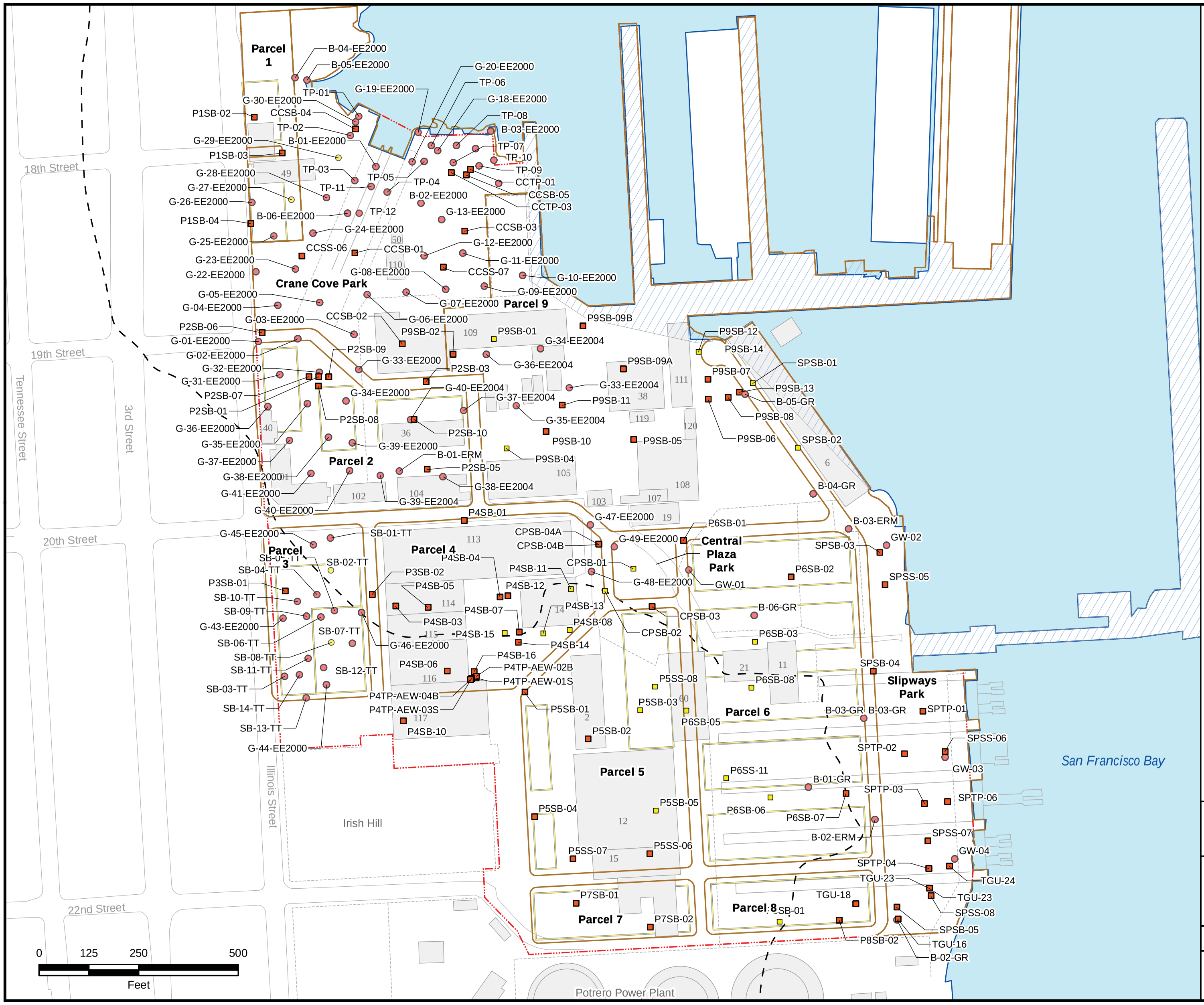
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

PAH RESULTS AND ESL EXCEEDANCES IN DEEP SOIL (>10 FEET)

Date 9/16/2010 | Project 4963.01 | Figure ES-13

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-054.mxd



Legend

Historical Sample Location

- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location

- ▫ Not Detected
- ■ Detected Below ESL
- ■ Exceedance of ESL

Surface Feature

- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
2. Current and recent historical shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/ website/sfshare/catalog/sfshoreext.zip.
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4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

METALS RESULTS AND ESL EXCEEDANCES IN SHALLOW SOIL (0-10 FEET)

Date 1/10/2011	Project 4963.01	Figure ES-14

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-052.mxd

Legend

Historical Sample Location
- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location
- □ Not Detected
- ■ Detected Below ESL
- ■ Exceedance of ESL

Surface Feature
- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
2. Current and recent historical shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/ website/sfshare/catalog/sfshoreext.zip.
3. Approximate 1869 Shoreline based upon Board of Tidelands Commissioners, *Map of the Salt Marsh and Tide Lands and Lands Lying Under Water South of Second Street and Situate in the City and County of San Francisco*, 1869.
4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

METALS RESULTS AND ESL EXCEEDANCES IN DEEP SOIL (>10 FEET)

Date 9/16/2010 | Project 4963.01 | Figure ES-15

Treadwell&Rollo

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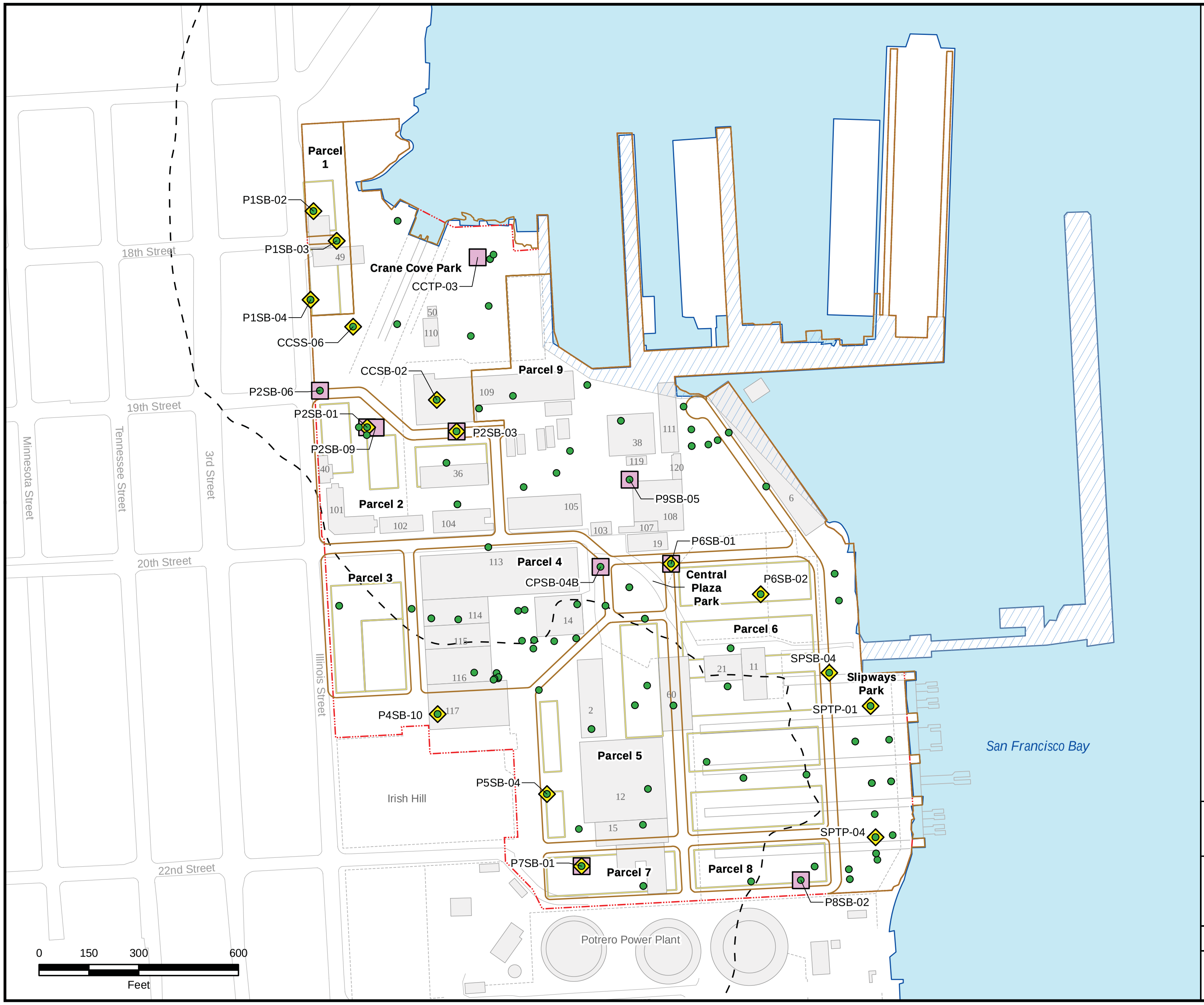

Legend

California Hazardous Material Criteria Result

- ● Non Hazardous
- ◆ Exceeded California Soluble Threshold Limit Concentration (STLC) - State of California Non-RCRA
- ■ Exceeded California Total Threshold Limit Concentration (TTLC) - State of California Non-RCRA

Surface Feature

- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- Pile-Supported Structure Over Water

Notes:

1. Some locations show results that both exceed and do not exceed the hazardous waste standards. In such cases, samples were collected at differing depths and provided more than one result per location.
2. No samples exceeded the Federal Toxicity Characteristic Leaching Potential (TCLP).
3. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
4. Shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/website/sfshare/catalog/sfshoreext.zip.
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6. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
7. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

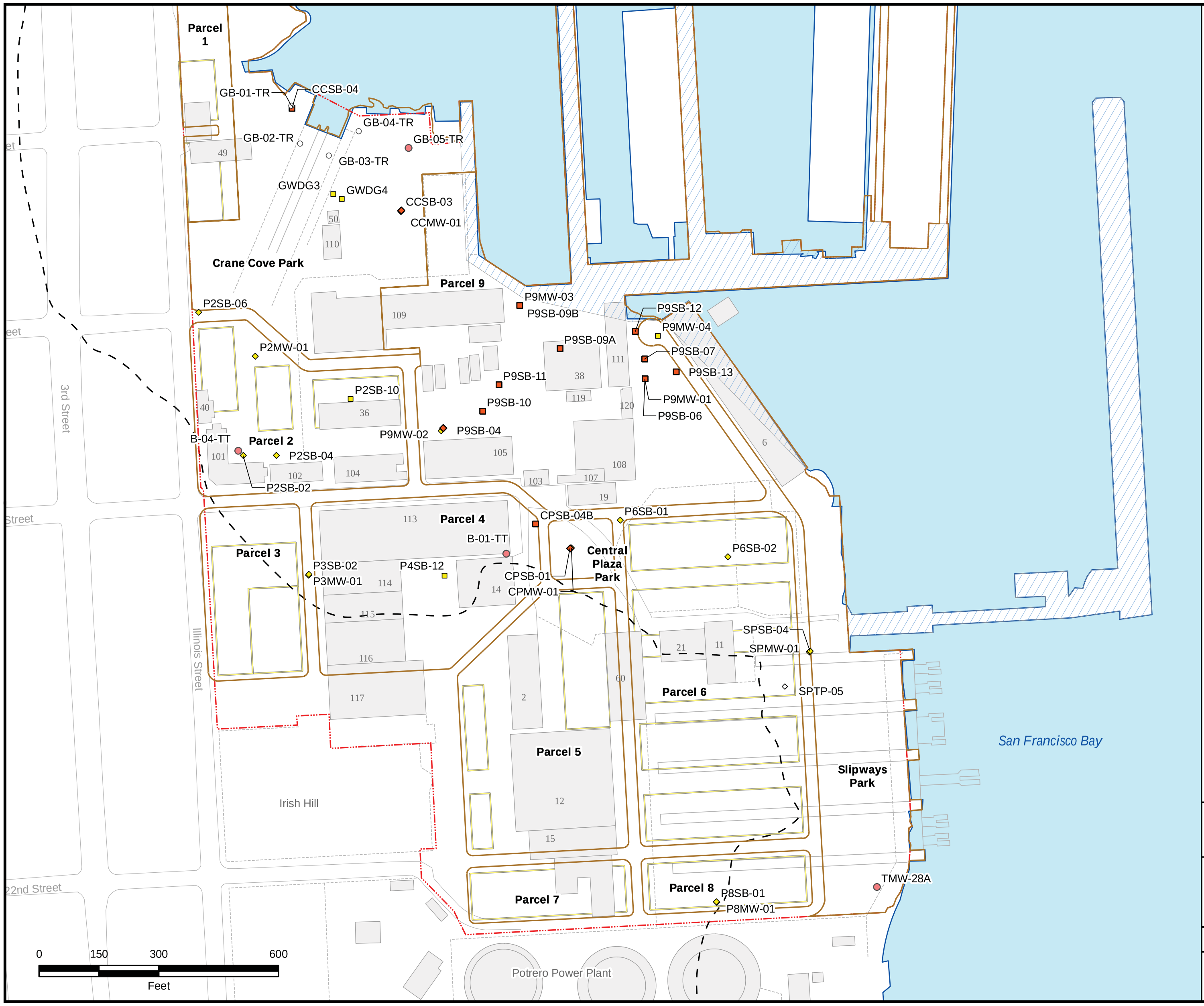
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

CALIFORNIA HAZARDOUS MATERIAL CRITERIA EXCEEDANCES IN SHALLOW SOIL 0 TO 10 FEET

Date 10/5/2010	Project 4963.01	Figure ES-16

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-065.mxd



N

Legend

Historical Sample Location
- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location

Phase 1
- ◇ Not Detected
- ◆ Detected Below ESL
- ◆ Exceedance of ESL

Phase 2
- ■ Detected Below ESL
- ■ Exceedance of ESL

Surface Feature
- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
2. Current and recent historical shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/ website/sfshare/catalog/sfshoreext.zip.
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4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

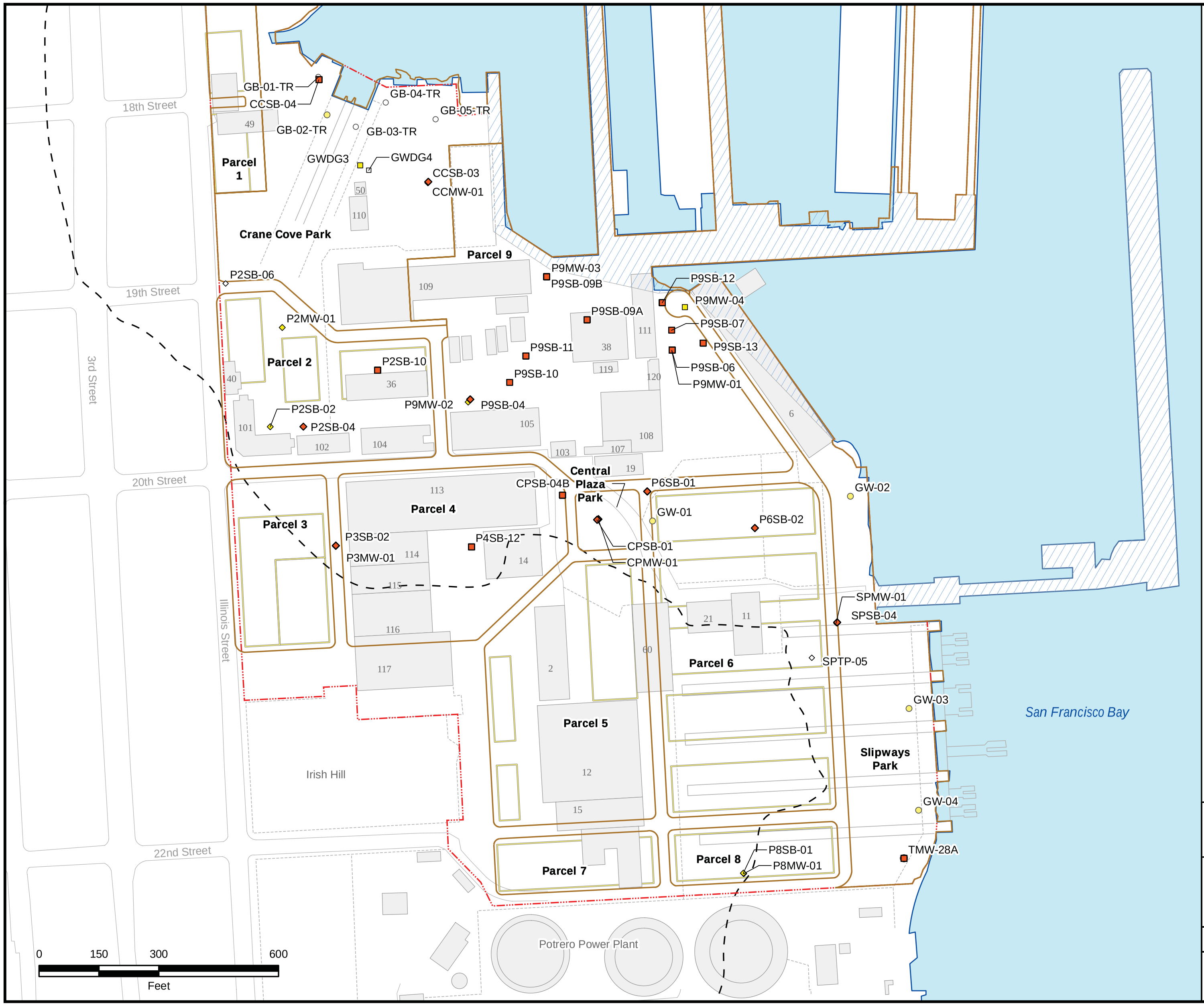
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

TPH RESULTS AND ESL EXCEEDANCES IN GROUNDWATER

Date 9/17/2010 | Project 4963.01 | Figure ES-17

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-075.mxd



Legend

Historical Sample Location

- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location

Phase 1

- ◇ Not Detected
- ◆ Detected Below ESL
- ◆ Exceedance of ESL

Phase 2

- □ Not Detected
- ■ Detected Below ESL
- ■ Exceedance of ESL

Surface Feature

- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- ▨ Building
- ▭ Proposed Building
- ▭ Pier 70 Site Area
- ▭ Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
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4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

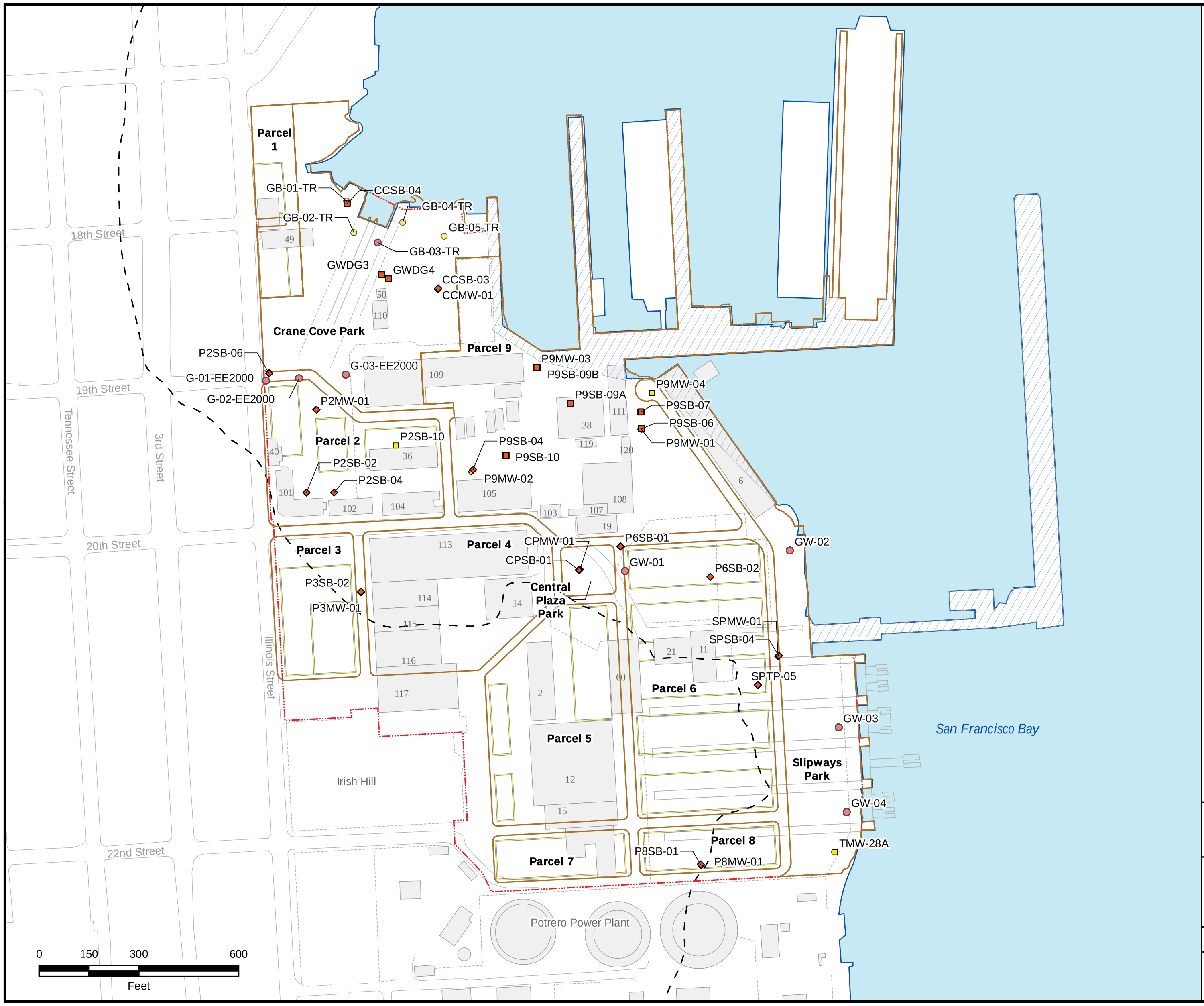
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

PAH RESULTS AND ESL EXCEEDANCES IN GROUNDWATER

Date 9/17/2010	Project 4963.01	Figure ES-18

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-077.mxd



Legend

Historical Sample Location

- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location

Phase 1

- ◇ Not Detected
- ◆ Detected Below ESL
- ◆ Exceedance of ESL

Phase 2

- □ Not Detected
- ■ Detected Below ESL
- ■ Exceedance of ESL

Surface Feature

- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
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4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

METALS RESULTS AND ESL EXCEEDANCES IN GROUNDWATER

Date 9/17/2010	Project 4963.01	Figure ES-19

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-076.mxd

Legend

Sample Location

- ⊕ Monitoring Well
- ⊡ Geotechnical Boring
- ■ Soil
- ○ Soil and or Groundwater
- ◇ Soil Gas
- ✦ Soil Gas Probe
- ▩ Test Pit
- Approximate 1869 Shoreline
- ➡ Approximate Groundwater Flow Direction

Surface Feature

- Fence
- Other
- Road Edge
- Area of Non-aqueous Phase Liquid (NAPL)
- Approximate Area of Shallow Bedrock
- ▨ *Historical Manufactured Gas Plant Subsurface Investigation Area*
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
2. Shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/website/sfshare/catalog/sfshoreext.zip.
3. Approximate 1869 Shoreline based upon Board of Tidelands Commissioners, *Map of the Salt Marsh and Tide Lands and Lands Lying Under Water South of Second Street and Situate in the City and County of San Francisco*, 1869.
4. Site boundary and parcels from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Historical Manufactured Gas Plant Subsurface Investigation Area taken from AMEC Geomatrix , *Report of Results: Subsurface Investigation Activities Evaluation of Impact to Fill and Bay Mud, Potrero Power Plant*, Figure 2, September 2010.
6. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

NATURE AND EXTENT OF NAPL IN SOIL AND GROUNDWATER

Date 1/10/2011	Project 4963.01	Figure ES-20

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-060.mxd

1.0 INTRODUCTION

Treadwell & Rollo | A Langan Company prepared this Site Investigation (SI) Report to present the results of the SI conducted at the Pier 70 Master Plan Area (Site) in San Francisco, California (Figure 1) for the Port of San Francisco (Port). The purpose of the SI was to identify and collect the data needed to support a risk assessment and feasibility study (FS) to identify potential areas needing remediation, and to develop a risk management plan (RMP) to be implemented during and after Site redevelopment. The SI focused on the upland portion of the Site and assessed soil gas, soil, and groundwater impacts. It does not include assessment of hazardous building materials or intertidal or offshore sediment impacts. This SI report includes a Human Health Risk Assessment (HHRA) and an Ecological Screening-Level Risk Assessment (ESLRA). The SI was performed in general accordance with the *Site Investigation Work Plan for the Pier 70 Master Plan Area, San Francisco California* (Work Plan) prepared by T&R, dated 29 October 2009, and approved by the San Francisco Bay Regional Water Quality Control Board (Water Board) in a letter dated 15 October 2009. This SI report presents findings and recommendations regarding the potential impacts of contamination on Site redevelopment and was prepared with oversight by the Water Board and the San Francisco Department of Public Health (SFDPH).

1.1 Site Description and History

The Pier 70 Master Plan Area (Figure 2) is located on the eastern shoreline of San Francisco at Potrero Point (a continuation of serpentinite based Potrero Hill). It is roughly bounded by 22nd Street to the south, Illinois Street to the west, and San Francisco Bay to the north and east. The Site encompasses approximately 69 acres and is largely underlain by fill material placed seaward of the San Francisco historic shoreline (Figure 2) between the late 1800s to early 1900s. The original shoreline was comprised of serpentinite bluffs overlooking mud flats that extended into San Francisco Bay. Much of the land that now makes up the Site was constructed by blasting the serpentinite hills of Potrero Point (Port of San Francisco, 2009a) and placing the resultant rock in the bay to create new land along the shoreline.

Since the 1890s, the area has been used for the manufacture, maintenance, and repair of marine vessels by companies including Union Iron Works, Bethlehem Steel, Todd Shipyards, Risden Iron Works, Southwest Marine, SF Drydock, and the US Navy. During World Wars I and II, Bethlehem Steel was one of the largest producers of destroyers and submarine ships. Operations at the Site have included administration and engineering offices, metal foundries, galvanizing shops, warehouses, paint shops, plating shops, powerhouses including boilers and transformers, dry docks, lumber and steel lay down yards, and ship docking slips and piers (T&R, 2007). Figure 3 presents a 1945 historical use map for Bethlehem Steel. An extensive rail system was present throughout the Site from the early 1900s to 1975 as observed in the historical Sanborn maps and shown on Figure 3.

Irish Hill was the neighborhood that housed many of the Irish immigrant workers that worked at the shipyards and other industrial businesses. Workers preferred to live within walking distance of their jobs since the work days were long and transportation was limited (Port of San Francisco, 2009a).

Recent land use has included metals recycling, car crushing and storage, ship repair, and warehousing. Currently, the largest tenant at the Site is BAE Systems San Francisco Ship Repair (BAE), which currently operates a dry dock and ship repair facility on approximately 15 acres of the Site (Figure 4). The second largest tenant is Auto Return, which provides towing and car return services for City of San Francisco. Other tenants include various storage and warehousing operations, and Sim's metals (a scrap metal yard). The Site also holds the AM broadcast transmitter for a commercial radio station.

The majority of the Site is covered by buildings or pavement. The AM Radio Tower area is generally unpaved, but is partially covered with gravel and debris. The Crane Cove Park area is mostly graveled or paved, but some areas contain weedy patches of vegetation. The shoreline consists of rock or rubble riprap or piers on pilings that extend out over the open water.

This Site is largely located bayward of San Francisco's historic shoreline (Figures 2 and 4). Article 22A of the San Francisco Public Health Code, administered by SFDPH, states that construction projects in San Francisco that are bayward of the historic 1852 high tide line and disturb more than 50 cubic yards of soil, require assessment of the site history and subsurface soil quality. This SI report presents information required by Article 22A. Previous investigations of properties bayward of the 1852 shoreline have found fill material with elevated levels of metals and petroleum hydrocarbons as a result of the 1906 earthquake and fire. Like many sites along San Francisco's waterfront that are comprised primarily of fill material, some fill soils at the Site contain contaminants that exceed hazardous waste threshold concentrations, and will require special handling and disposal. In accordance with the requirements of Article 22A, a site mitigation and health and safety plan will also be required before construction and off-haul of the fill materials to designated landfills.

1.2 Port's Master Plan for Pier70

In 2007, the Port commenced a public planning process to produce the Pier 70 Preferred Master Plan dated April 2010 (the Master Plan). The results of this SI are intended to support redevelopment of the Site in accordance with the Master Plan. The Master Plan envisions a redevelopment program that meets the following goals (Port of San Francisco, 2010):

- Reuse and rehabilitate maritime historic structures to be recognized in the National Register Historic District;
- Create new shoreline parks and open space;
- Integrate commercial and high density residential development, and shoreline parks and open space with the existing ship repair and dry dock industry; and
- Develop a land use plan that will respect historic character as well as promote economic development.

The Master Plan divided the Site into Parcels 1 though 9, and into four parks including Crane Cove Park, Slipways Park, Irish Hill and Central Plaza (Figure 5). The following summarizes potential future land use for each Parcel:

- Parcels 1 and 3 - Parcel 1 contains one historical building that is slated for reuse and another building that is slated to be demolished. Parcel 3 is a paved area currently occupied by a storage business. After redevelopment, both parcels will be largely occupied by new buildings, with the historical Twigg/Kneass Building remaining on Parcel 1. Parcels 1 and 3 both face Illinois Street, and both areas could potentially have high density residential use after redevelopment.
- Parcels 2 and 4 - Parcels 2 and 4 contain the majority of the historical structures that remain on the Site and are anticipated to be restored and reused as part of the redevelopment. When redeveloped, the historical structures will be refurbished and may include commercial, retail, restaurant, cultural/institutional (e.g. museum or arts venue), or other public uses.
- Parcels 5, 6, 7 and 8 - Parcels 5, 6 and 7 include historic and other structures that will be rehabilitated for reuse or demolished and removed. Parcels 6 and 8 are underlain by four historical slipways, which have been completely filled in and paved over. Future Site

use is anticipated to be commercial or light industrial, such as a "tech campus", consisting largely of new, multi-story buildings.

- Parcel 9 – This parcel will remain leased to BAE and continue to operate as a ship repair and dry dock facility.
- Crane Cove, Slipways, Irish Hill and Central Plaza Parks - The dominant feature of Crane Cove Park is the large, exposed slipway that runs diagonally across the proposed park area. There are another three, smaller historical slipways that are partially or fully filled. In addition, there are two small buildings that formerly housed a substation (Building 50) and a laundry (Building 110). Generally, this area is vacant.

  The dominant features of Slipways Park are the four historical slipways that have been fully in-filled and paved over. This area is leased to tenants for automobile storage and trucking. Irish Hill is currently a vacant area that in part separates the Potrero Power Plant from the Site. Central Plaza Park is currently within an automobile storage lot. These designated parks and open space areas will be developed with landscaped and "hardscaped" (i.e. paved plazas and walkways) surfaces.

1.3 Objectives of SI

The objectives of the SI are to:

- Update the initial Site Conceptual Model (SCM) using SI data;
- Collect and analyze soil gas and groundwater samples for chemicals of potential concern (COPCs) that had been detected in previous investigations or were associated with potential sources areas to provide chemical concentration data needed to support the HHRA, ESLRA, FS;
- Collect soil chemical concentration data required by Article 22A to estimate hazardous waste soil volumes that could require special handling and disposal at designated landfills; and,
- Identify and collect the data needed to develop a RMP to be implemented during Site redevelopment.

1.4 Report Organization

This report is organized as follows.

- Section 1 presents the project background, the Port's Master Plan, and the objectives of the SI.
- Section 2 presents a historical review, previous investigation results, and COPCs.
- Section 3 presents site conceptual model, remedial action objectives, and screening levels.
- Section 4 presents the SI approach, field procedures and laboratory analysis, data validation results, and deviations from the Work Plan.
- Section 5 presents the analytical and quality assurance/quality control (QA/QC) results.
- Section 6 presents the nature and extent of impacts within the parcels identified in the draft Master Plan.
- Section 7 presents the HHRA.
- Section 8 presents the ESLRA.
- Section 9 presents Summary and Conclusions.
- Report references follow the report text.
- Tables, Figures and Photographs follow the references.

Appendices and their contents are listed in the Table of Contents.

2.0 BACKGROUND AND PREVIOUS INVESTIGATION RESULTS

2.1 Pier 70 Historical Use and Potential Source Areas

In developing the Work Plan, T&R reviewed historical records including an Environmental Data Base Report (EDR), previous environmental investigation reports, aerial photographs, Sanborn Fire Insurance Maps, historical topographic maps and Site title information. A detailed historical review is presented in the Work Plan and Tables 1 and 2.

2.1.1 Chronology of Site Use of Pier 70

Pier 70 has been a shipbuilding facility and industrial site since the Gold Rush. A chronology of the Site from 1850 to the present is provided in this section and is based on the historical information identified on Sanborn Maps and information obtained from www.pier70sf.org and www.sfport.com/Pier70. Historical (1885 to 1945) and current land uses at the Site are shown in Figures 3 and 4, respectively. Historical Site operations are listed by Master Plan Area in Table 1.

Key milestones for the Site include:

1850s to 1870s	The Site was occupied by a shipbuilding facility known as North's Shipyard. Other Site uses included two to three blasting powder manufactures, the famous *Cordage Rope Walk* of the Tubbs Cordage Company which was a covered pier over one thousand feet long that extended into San Francisco Bay allowing cordage workers to twist fiber strands into very long ropes, iron and steel mill operated by Pacific Rolling Mills (started in 1868), refinery operated by Spreckels Sugar, and iron casting foundry by Union Iron Works.
1884	The Union Iron Works began shipbuilding and repair.
1890	Risdon Iron and Locomotive Works purchased the Pacific Rolling Mills, demolished all the mill buildings and established a shipyard.
1905	Bethlehem Steel Corporation purchased Union Iron Works, and expanded and continued shipbuilding operations until 1965.
1917 to 1924	Bethlehem Steel built 66 destroyers and 18 submarines for WW I.
1940 to 1947	Bethlehem Steel built 72 vessels and repaired over 2,500 during WW II.
1965 to 1982	Site was primarily used for ship repair.
1982	Bethlehem Steel went bankrupt and sold its Pier 70 facility to the Port.
1982 to present	Port of San Francisco leased much of the Site to Todd Shipyards, and subsequently to Southwest Marine, which was acquired by BAE Systems. Port also leased portions of the Site to the City and County of San Francisco Department of Transportation for automobile storage.

2.1.2 Potential Source Areas on Pier 70

Potential source areas of environmental concern have been identified based on the historic operations described above and more recent land uses documented for Pier 70. Table 1 presents a summary of previous operations by Master Plan area.

Shipbuilding, maintenance and repair operations on Pier 70 that are considered potential contaminant source areas include: metal foundries, galvanizing shops, machinery warehouses, plating shops, power generating facilities (burning coal and coke, boiler rooms, and transformers), planning mills, flange shops, and steel yards. Various environmental investigations have been conducted at the Site to address different objectives including characterization of areas for future land use development, regulatory compliance requirements, and source-specific characterization and delineation of known areas of contamination. A summary of these investigations is presented below by Master Plan parcel number or area designation (Port, 2010). A Historical Site Information Summary including potential source area locations, potential COPCs, and previous sampling and remediation activities is presented in Table 2. Potential source areas are illustrated on Figure 6.

2.1.2.1 Crane Cove Park

According to the Master Plan, Crane Cove Park will occupy approximately 7 acres in the northern portion of Pier 70. Historical information indicates that ironwork, and shipbuilding and repair operations occupied the area Crane Cove Park area since the late 1890s (Table 1). Between the late 1890s and 1986, the shipbuilding companies, Union Iron Works, Bethlehem Steel, and Todd Shipyards were occupants. More recent occupants have included B&C Metals and Kehoe Trucking.

Prominent historical features of Crane Cove Park included Slips 1, 2, 3, and 5 (Figure 3). In historical photographs, large welding platforms are identified adjacent to Slips 3 and 4. In addition, small buildings such as a Carpenters Shed, Riveters Shed, and Bolt Reclamation Building are identified on the slips. Two 50-ton cranes are located east and west of the south end of Slip 4 where railroad spurs are present. Buildings 110 and 50 are located between Slips 3 and 4. Building 110 was used as a laundry and locker room for shipyard employees. Building 50 was a sub-station which contained electrical transformers.

Potential source areas of contamination in Crane Cove Park include historical shipbuilding and maintenance operations (welding and sandblasting), fill material at Slips 1, 2, 3, and 4, and Building 50 (substation). Soil, sediment, and groundwater investigations were conducted in portions of Crane Cove Park during 2000 (Ecology and Environmental, Inc. [E&E], 2000), 2003 (E&E, 2004), and 2007 (T&R, 2008) to characterize soil and groundwater conditions. In addition, investigations were conducted around Building 50 to delineate and remediate contamination due to the release of polychlorinated biphenyls (PCBs) from former electrical transformers (AEW, 2008).

2.1.2.2 Parcel 1

Potential sources of contamination in the area of Parcel 1 include historical shipbuilding operations and underground storage tanks (USTs). Historical information indicates that ironwork, and boat building and repair companies occupied the area encompassing Parcel 1 since the early 1900s. Between the early 1900s and 1980s, the Geo W. Kneass Company conducted boat building in the northern portion of Parcel 1. Buildings identified as Boat Works were associated with this former occupant. In the 1987 Sanborn map, this area of Parcel 1 was identified as the Bay Area Maritime Institute Boat Building and Maritime Training School. Historical land use along the southern portion of Parcel 1 was similar to that of Crane Cove Park (T&R, 2009).

Building 49 is located within the central portion of Parcel 1. Historical use of this building has included a galvanizing plant, plate shop, and a warehouse for miscellaneous storage. Two USTs were formerly located along the south side of this building. Previous site investigations collected surface soil samples from predetermined grid locations south of Building 49 within the Parcel 1 in 2000 (E&E, 2000). This investigation incorporated a portion of Parcel 1 (Table 2).

2.1.2.3 Parcel 2

Potential sources of contamination in Parcel 2 include historical shipbuilding operations, USTs, and a powerhouse (Figure 6). Historical information indicates that residential development was located within Parcel 2 in the early 1900s. In 1914, buildings associated with the shipyard were constructed which included office buildings, a power house, and a welding shed. Shipbuilding companies, Union Iron Works, Bethlehem Steel, and Todd Shipyards, Southwest Marine Inc. and San Francisco Drydock Inc. (SFDI) may have been former occupants of the Parcel 2 area. Most recently, Advanced Waste Systems, a recyclable materials transporter, occupied a portion of Parcel 2.

Previous site investigations collected surface soil samples from predetermined grid locations north of Building 101 within Parcel 2 in 2000 (E&E, 2000) and 2003 (E&E, 2004) (Table 2). In addition, soil and groundwater samples were collected during the removal of the USTs in 1988, and additional soil and groundwater samples were collected in 1997 (Tetra Tech, 1997).

2.1.2.4 Parcel 3

Potential sources of contamination in the area of Parcel 3 include the welding shed in support of historic shipbuilding operations (Table 2 and Figure 6). In addition, a letter from the SFDPH indicated that a spill of hazardous materials and waste, and a faulty nozzle on a drum possibly containing petroleum products or antifreeze may have occurred on Parcel 3 (Tetra Tech, 1998). Historical information indicates that residential and commercial land use was located within Parcel 3 beginning in the early 1900s. By the mid 1940s, Bethlehem Steel Corporation occupied an office building, training school, and welding shed on Parcel 3. The majority of Parcel 3 was used for parking. By the 1980s, Parcel 3 is vacant of structures and used for parking by Todd Shipbuilding and later by Southwest Marine Inc.

Potential source areas in the area of Parcel 3 include the welding shed, hazardous materials and waste storage and releases. Surface soil samples were collected from predetermined grid locations within Parcel 3 described as the South of 20th Street in 2000 (E&E, 2000) to characterize soil conditions (Table 2).

2.1.2.5 Parcel 4

Potential sources of contamination in Parcel 4 include historical shipbuilding operations, USTs (USTs 104 and 105 and Building 117), PCBs, and burn debris (Table 2 and Figure 6). Historical information indicates that ironwork, shipbuilding, and repair companies occupied the area encompassing Parcel 4 since the late 1890s (T&R, 2009). Between the late 1890s and 1986, the shipbuilding companies, Union Iron Works, Bethlehem Steel, and Todd Shipyards have been identified as former occupants of Parcel 4. Southwest Marine, Inc. occupied the area from 1988 through 1993.

Prominent historical land use on the parcel included numerous buildings and structures associated with shipbuilding, maintenance, and repair operations. These buildings include machine shops, foundries, maintenance buildings, warehouses, and a boiler shop. Building 117 is located partially on the southern edge of Parcel 3 and was identified as a wire rope and miscellaneous storage building. A fire was reported in 1980 either within or near Parcel 4 that damaged a sub-station causing PCB contamination (Iris, 2002).

Soil and groundwater samples were collected during the removal of the USTs east of Building 113 in 1988 and additional soil and groundwater samples were collected in 1997 (Tetra Tech, 1997). In addition surface soil samples were collected in the UST area within Parcel 4 in 2000 (E&E, 2000) to characterize soil conditions. Four former USTs were documented to be associated with Building 117. Two of these USTs were removed and two were abandoned in place (Tetra Tech, 1998).

2.1.2.6 Parcel 5

Potential sources of contamination in Parcel 5 include historical shipbuilding operations, two USTs, and "City Tow", a former operator of an automobile storage facility under contract to the City and County of San Francisco Department of Parking and Traffic (Table 2 and Figure 6). Historical information indicates that shipbuilding operations and metal fabrication have been conducted in the area encompassing Parcel 5. General plans for the Bethlehem Steel Company Ship Building Division identify these operations as early as 1945 (www.sfport.com/Pier70). Buildings and operations associated with shipbuilding, maintenance, and repair operations include machine shops, plating shops, a layout yard, and warehouses. In the early 1950s, US Steel Products Company operated by the Union Iron Works Company appeared to operate these buildings. City Tow began operation on Parcel 5 in 1987. City Tow stored automobiles, trailers, boats, and recreational vehicles on leased property in Parcel 5. In addition to vehicle storage, operations included the dismantling of vehicles, parts scrapping and selling, and car crushing (Figures 4 and 6).

Previous soil and groundwater investigations in areas formerly leased to City Tow, predominantly in the northern portion of Parcel 5, identified petroleum contamination, primarily from a small area where City Tow crushed vehicles. City Tow conducted limited remedial activities, including the removal of contaminated soil and asbestos containing material located around exposed subsurface piping (Iris, 2001, 2002, 2004, and 2005).

2.1.2.7 Parcel 6

Potential sources of contamination in Parcel 6 include historical shipbuilding operations and fill material associated with the former slips. Historical information indicates that shipbuilding, maintenance, and repair had been conducted in the area encompassing Parcel 6 (Figure 3) as early as 1945 (www.sfport.com/Pier70). In the early 1950s, these operations were conducted by US Steel Products Company owned by the Union Iron Works Company.

Prominent historical features of Parcel 6 included Slips 5, 6, 7, and 8. In historical photos, large welding platforms are identified on Parcel 6. Historical buildings associated with shipbuilding activities include metal fabrication, riggers and painters shop, sheet metal shop, and sub-stations (Figure 6). Recent land use included vehicle storage by City Tow and Auto Return (Figure 4).

Soil and groundwater investigations within Parcel 6 have characterized the fill material placed during the backfilling of the Slips 5 through 8 (Mark Group, 1990 and Tetra Tech, 2000).

2.1.2.8 Parcels 7 and 8

Potential sources of contamination in Parcels 7 and 8 include demolition debris and earthen material used to fill the slipways in the 1970s (Parcel 8), the boiler room (Parcel 7), and the migration of contaminants associated with the former Manufactured Gas Plant (MGP) located at the Potrero Power Plant Site immediately to the south (Parcel 8) (Table 2 and Figure 6). PG&E is currently investigating the extent of MGP related contaminants in the area (AMEC, 2010). Historical information indicates that shipbuilding and repair support activities had been conducted in the area encompassing Parcels 7 and 8. Soil and groundwater sampling have been conducted on Parcel 8 previously as part of Potrero Power Plant investigations (AMEC, 2008) and due to the fill material placed during the backfilling of the former slipways (Mark Group, 1990, ERM West, 1990, and Tetra Tech, 2000).

2.1.2.9 Parcel 9, Ship Repair

Potential sources of contamination in Parcel 9 include historical shipbuilding operations, a former petroleum above ground storage tank (AST) and fill material (Table 2 and Figure 6). Historical information indicates that ironwork, and shipbuilding and repair companies had occupied the area encompassing Parcel 9 since the late 1890s. Between the late 1890s and 1986, the shipbuilding companies, Union Iron Works, Bethlehem Steel, and Todd Shipyards occupied Parcel 9. Southwest Marine, Inc. occupied the area from 1988 through 1993. In 1993 or early 1994, operations were transferred from Southwest Marine, Inc. to San Francisco Drydock Inc.

Prominent features include the piers and dry docks which extend into the Central Basin along the northern portion of the Ship Repair parcel (Figures 2 and 3). Historical land use for the remainder of the area includes shipbuilding, maintenance, and repair operations including plating shops, forge shops, planning mills, power generating facilities (electrical rooms, boiler rooms, and sub-stations), metal foundries, warehouses, and painters shops among other buildings. A 4,170 barrel AST was located south of Building 111 (Figure 6), releases from which may be the source of heavy degraded petroleum hydrocarbons or non-aqueous phase liquid (NAPL) as discussed below in Sections 5.4.6 and 6.3 In addition, a 23 August 1936 Bethlehem Shipbuilding Corporation memo proposing a sheet pile bulk head north of current Buildings 38 and 111 states that between seven and 17 feet below ground surface (bgs) a coarse gravel fill layer is present, and that the groundwater has been replaced by "oil with no known origin" (Bethlehem Steel, 1936). Surface soil samples were collected from predetermined grid locations south of Building 109 within the Ship Repair parcel in 2003 (E&E, 2004) to characterize soil conditions in a portion of Parcel 9.

2.1.3 Potential Source Areas on Adjoining Properties

The area surrounding the Site has had a variety of uses since the early 1900s including residential, industrial and commercial use. By 1914, heavy industry began to emerge in the surrounding area. Potential sources of contamination adjacent to the Site include historic MGP operations at the Potrero Power Plant property located immediately south of the Site, and former fuel storage and distribution facilities located along the west side of Illinois Street between 19th Street and Mariposa Street (T&R, 2009) (Figure 6). Pacific Gas & Electric (PG&E) and its predecessors operated a MGP at the Potrero Power Plant property from 1872 to approximately 1930, when the plant went on stand-by, with the last gas production in 1953.

The bulk fuel distribution centers were identified north and east of the Site on the Sanborn maps between the years 1950 and 1987 (T&R, 2009). Numerous gasoline or fuel ASTs were observed at these facilities. Results of the SI did not indicate petroleum hydrocarbon environmental impacts to Parcel 1 and

Crane Cove Park, which are located in the presumed downgradient direction of groundwater flow from the former fuel storage and distribution sites.

Outcrops on Irish Hill and shallow bedrock along Illinois Street contain serpentine which contains naturally occurring asbestos (NOA) (ERM, 1990). NOA in serpentinite rock can be released if the serpentine is crushed or pulverized. NOA particulates represent a potential health risk if inhaled. As discussed in Section 5, SI data indicates NOA occurs in soil in some areas at levels less than 1% to 2%, however NOA dust mitigation will be included in the RMP.

As part of its ongoing site investigations, in 2009, PG&E, investigated soil and sediment contamination related to historic MGP operations using "Tar-specific green optical screening tool" (TarGOST), which provides a semi-quantitative indication of coal tars, creosotes, heavy crudes, and tank bottoms. TarGOST sampling (Section 4) indicates that dense non-aqueous phase liquid (DNAPL) from the Potrero Power Plant has migrated north from the power plant site and is present beneath the eastern portion of Parcel 8 and the southern portion of Slipways Park. Soil and groundwater in the impacted area contain polycyclic aromatic hydrocarbons (PAHs), benzene, toluene, ethylbenzene, xylenes (BTEX), petroleum hydrocarbons, and metals.

2.2 Previous Environmental Investigation Findings

Previous site investigations have been conducted in Parcels 1, 2, 3, 4, 6, 8, 9, and Crane Cove and Slipways Parks. Table 2 summarizes previous investigations conducted within these Parcels. Figure 7 presents sampling locations from previous investigations.

Previous soil and groundwater investigation results were compared to Water Board Commercial and Residential Environmental Screening Levels (ESLs) for both soil and groundwater (Water Board 2008, Table B). Groundwater results were also compared to vapor intrusion ESLs (Water Board, 2008a, Table E-1). Summaries of results from previous investigations where concentrations in soil or groundwater exceed ESLs for Parcels 1, 2, 3, 4 and 6, Crane Cove Park and Slipways Park are presented in tables and on figures in Appendix B. COPCs presented in the tables include metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), PAHs, PCBs, pesticides, and total petroleum hydrocarbons (TPH). Soil and groundwater ESL exceedances are also shown on Figures B-1 through B-5. Groundwater vapor intrusion ESL exceedances are shown on Figure B-6.

2.2.1 Previous Soil Results

Previous soil sample locations are shown on Figure 7. Soil data exceeding ESLs are presented in Tables B-1 and B-2 and locations shown in Figures B-1 through B-5. Pesticides did not exceed ESLs in any previously-collected soil samples.

2.2.1.1 Parcel 1

One PAH and one VOC exceeded ESLs in one out of four samples analyzed. In sample location G-25-EE2000, benzo(a) pyrene (B(a)P) was reported at 0.64 milligrams per kilogram (mg/kg) (Table B-1 and Figure B-3). Acetone was reported in G-27-EE-2000 at a concentration of 2.2 mg/kg (Table B-1 and Figure B-2).

2.2.1.2 Parcel 2

Previous soil sampling results for metals, PAHs, VOCs, and TPH in Parcel 2 exceeded ESLs. Antimony, arsenic, copper, lead and nickel results exceeded ESLs in 14 out of 38 samples collected. Sample depths, concentrations, and locations are presented in Table B-2 and on Figure B-1. Of the 38 soil samples collected, results from 18 samples exceeded ESLs for PAHs, including the following compounds: anthracene, benzo(a)anthracene (B(a)A), B(a)P, benzo(b)fluoranthene (B(b)F), benzo(k)flouranthene (B(k)F), benzo (g,h,i)perylene (B(g,h,i)P), chrysene, dibenz(a,h) anthracene (D(a,h)a), flouranthene, indeno(1,2,3-c,d)pyrene (I(1,2,3-c,d)P, and phenanthrene (Table B-1 and Figure B-3). In sample location G-39-EE-2000, acetone was the only VOC reported above the ESL (0.5 mg/kg) at a concentration of 1.1 mg/kg in (Table B-1 and Figure B-2). The TPH as motor oil (TPHmo) ESL of 2,500 mg/kg was exceeded in two sample locations (Table B-3 and Figure B-5) and concentrations ranged from 2,700 mg/kg in sample location G-39-EE2004 to 6,200 mg/kg in sample location G-38-EE2000.

2.2.1.3 Parcel 3

Arsenic, copper, lead, nickel, vanadium and zinc in 12 out of 22 soil samples exceeded ESLs. Sample depths, concentrations, and locations are presented in Table B-2 and on Figure B-1. Benzene was reported above the ESL (0.27 mg/kg) in sample location G-46-EE2000 at 0.53 mg/kg (Table B-1 and Figure B-2). In three out of 22 samples collected, ESLs were exceeded for the following PAH compounds;

B(a)A, B(a)P, B(b)F, D(a,h)A, and I(1,2,3-cd)P. Sample depths, concentrations, and locations are presented in Table B-1 and on Figure B-3.

2.2.1.4 Parcel 4

TPH as diesel (TPHd) and TPHmo were the only compounds that exceeded ESLs in one out of four samples collected. In sample location B-01-TT at a depth of 8.5 feet below ground surface (bgs), TPHd and TPHmo were reported at 2,600 mg/kg and 2,700 mg/kg, respectively (Table B-1 and Figure B-5).

2.2.1.5 Parcel 6

In Parcel 6, 18 out of 19 soil samples contained the following metals at concentrations exceeding ESLs: antimony, arsenic, cadmium, cobalt, copper, lead, mercury, nickel, thallium, vanadium, zinc and selenium. Sample depths, concentrations, and locations are presented in Table B-4 and on Figure 7. VOCs, PAHs, SVOCs, and TPH were not detected above ESLs (Table B-3 and Figures B-2, B-3, and B-5).

2.2.1.6 Parcel 9

In Parcel 9, metals, PAHs, and TPH in soil exceeded ESLs. Arsenic, copper, lead, mercury, nickel, thallium, zinc, and selenium exceeded ESLs in 10 out of 16 soil samples collected (Table B-2 and Figure 7). In five out of 16 samples collected, PAHs (B(a)A, B(a)P, B(b)F, and D(a,h)A) exceeded ESLs. Sample concentrations and locations are presented in Table B-1 and Figure B-3. In two out of 16 samples, TPHd and TPHmo were reported above ESLs (180 mg/kg and 2,500 mg/kg) at sample locations G-35-EE2004 and G-36-EE2004 at concentrations of 7,500 mg/kg and 6,300 mg/kg, respectively (Table B-1 and Figure B-5).

2.2.1.7 Crane Cove Park

In Crane Cove Park, metals, VOCs, PAHs, and PCBs in soil exceeded ESLs. In sample location G-03-EE2000, arsenic and lead were the only two metals that exceeded ESLs (Table B-2 and on Figure B-1). Acetone was reported above the ESL (0.5 mg/kg) at a concentration of 0.99 mg/kg (Table B-3 and Figure B-4). In 24 out of 69 samples collected, PAHs (B(a)A, B(a)P, B(b)F, B(k)F, D(a,h)A and I(1,2,3-cd)pyrene) exceeded ESLs (Figure B-3). PCBs exceeded the ESL in soil samples at depths, concentrations, and locations are presented in Table B-3 and on Figure B-4. Pesticide concentrations in soil did not exceeded ESLs in any samples.

2.2.1.8 Slipways Park

In Slipways Park, metals, PAHs, SVOCs, and TPH exceeded ESLs. Arsenic, copper, mercury, nickel, thallium, zinc, and selenium in 12 out of 13 samples collected exceeded ESLs (Table B-2 and Figure B-1). In 6 out of 13 samples collected, PAHs (anthracene, pyrene, B(a)A, B(a)P, B(b)F, B(g,h,i)P, B(k)F, chrysene, D(a,h)A, flouranthene, and I(1,2,3-cd)pyrene, phenanthrene, methylnaphthalene, acenaphthene, acenaphthylene, flourene, and naphthalene) exceeded ESLs (Table B-1 and Figure B-3). TPHd and TPHmo were reported above ESLs (180 mg/kg and 2,500 mg/kg) in sample location GB-31 at concentrations of 9,300 mg/kg and 6,300 mg/kg, respectively (Table B-1 and Figure B-5).

2.2.2 Previous Groundwater Results

Groundwater sample locations and samples that contained contaminants at concentrations greater than drinking water/surface water ESLs (Table B) are summarized in Figures B-1 through B-5 and Table B-5. A comparison of VOC and SVOC concentrations in groundwater with ESLs for potential risk of vapor intrusion (VI) into buildings is shown in Figure 26. No groundwater samples from previous investigations at Pier 70 contained VOCs or SVOCs at concentrations above the VI ESLs; however, two samples collected on the Potrero Power Plant property exceeded VOC VI ESLs (Figure B-6).

2.2.2.1 Parcel 2

In Parcel 2, metals and TPH compounds exceeded ESLs. In two out of three groundwater samples collected, copper, lead, mercury, nickel, and zinc exceeded ESLs. Arsenic and chromium concentrations each exceeded their respective ESL in one sample. Sample concentrations, depths and locations are presented Table B-3 and Figure 7. TPHd was reported above the ESL (210 micrograms per liter [µg/L]) in one sample location (B-04TT) at a concentration of 1,100 µg/L (Table B-3 and Figure B-5).

2.2.1.2 Parcel 4

In one out of two samples collected from Parcel 4, TPHd and TPH as gasoline (TPHg) were the only compounds that exceeded the ESL of 210 µg/L, and were reported at 41,000 µg/L and 430 µg/L, respectively (Table B-3 and Figure B-5).

2.2.1.3 Parcel 6

In Parcel 6, metals were the only compounds that exceeded groundwater ESLs. Arsenic, boron, copper, lead, mercury, thallium, and zinc exceeded ESLs in one out of seven groundwater samples collected (Table B-3 and Figure B-1).

2.2.1.4 Crane Cove Park

In Crane Cove Park, metals and TPHmo were the only compounds that exceeded ESLs. Antimony, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc exceeded ESLs in two out of seven groundwater samples collected (Table B-3 and Figure B-1). TPHmo was reported in only one sample (GB-05-TR), at a concentration of 342 µg/L (Table B-3 and Figure B-5).

2.2.1.5 Slipways Park

In Slipways Park, metals, PAHs, and TPHd exceeded ESLs. In three out of 20 samples collected, ESLs were exceeded for nine to 13 of the following metals: antimony, arsenic, barium, boron, chromium, cobalt, copper, lead, mercury, nickel, silver, thallium, vanadium, zinc and selenium (Table B-3 and Figure B-1). In one out of 20 samples collected, PAHs (B(a)A, pyrene, phenanthrene, and naphthalene) exceeded ESLs. Sample depths, concentrations, and locations are presented in Table B-3 and on Figure B-3.

2.3 Contaminants of Potential Concern

For the purpose of this SI and risk assessment, contaminants of potential concern (COPCs) are either those chemicals that are naturally occurring or associated with historical site uses or potential source areas that have been detected in previous environmental investigations as discussed in Section 2.2 (Tables 1 and 2 and Figure 6). These COPCs include:

- TPHg, TPHd, and TPHmo
- VOCs
- PCBs and dioxins
- SVOCs
- Pesticides
- PAHs
- Metals including arsenic (As), antimony (Sb), cadmium (Cd), cobalt (Co), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni), thallium (Tl), vanadium (V) and zinc (Zn), and
- NOA

3.0 DETERMINATION OF SCREENING LEVELS

This section presents the site conceptual model (SCM) for the Site, site-specific remedial action objectives (RAOs) for soil, groundwater, and soil gas; and preliminary screening levels for chemical results.

3.1 Site Conceptual Model

An initial SCM was developed and presented in Section 2.4 of the Work Plan to understand the potential sources of contamination, COPCs, potentially affected media (soil gas, soil, and groundwater), and transport and exposure pathways that could potentially impact human or ecological receptors. The SCM synthesizes what is known to date into a snapshot that communicates the Site physical setting and COPC release or exposure mechanisms. Based on the findings of the site investigation, the initial SCM was updated and the current SCM is presented in Figure 8. As presented in Section 2.2, results from previous investigations indicated that there are COPC in soil in all parcels, and in groundwater in Parcels 2, 4, 6, and Crane Cove Park (Figures B-1 through B-6). Metals, TPH, PAHs, and PCBs have been detected in subsurface soil. Metals, TPH, PAHs, and VOCs have also been detected in groundwater. Soil gas samples had not been collected previously. The likely sources of these COPCs are the historic Bay fill material, former fuel use and storage, and shipbuilding and other industrial operations located at the Site. Chemicals may have been placed during Bay infilling, spilled at the ground surface or released in the subsurface soil and leached to shallow groundwater. Some COPCs (NOAs and metals including arsenic, cadmium arsenic, cadmium, copper, chromium, nickel, thallium, vanadium, and zinc) are naturally-occurring in the native rock and soil. Groundwater contaminants may have spread following the direction of the shallow groundwater gradient. VOCs in soil and groundwater also may have volatilized into the soil pore space above the groundwater table.

Based upon the types of chemicals present at the Site and the media in which the chemicals are present, the following mechanisms for chemical transport have been identified for the Site:

- Volatilization of VOCs from soil and groundwater into soil pore space (soil gas)
- Leaching of COPCs from soil into groundwater
- Transport of COPCs in groundwater via groundwater flow

The following potential human exposure routes for chemicals have been identified for the Site:

- Inhalation of VOCs volatized from soil gas
- Dermal contact inhalation and incidental ingestion of soil particulates
- Dermal contact with groundwater

The Site groundwater is not currently used for or planned to be used for domestic purposes in the future.

The following ecological exposure routes for chemicals have been identified for the Site (Figure 8):

- Inhalation of VOCs volatized from soil gas in burrow air
- Incidental ingestion and dermal contact of soil particulates
- Plants' direct uptake of contaminated groundwater and contaminated sediments
- Ingestion and contact with contaminated Bay water

The updated SCM is discussed further in Sections 7 and 8.

3.2 Preliminary Remedial Action Objectives

Remedial Action Objectives (RAOs) are typically developed for human and ecological receptors (plants and animals). RAOs consider the COPCs and potential exposure routes and receptors as well as compliance with Local, State, and Federal environmental laws and regulations. The sources of site contamination, receptor that could be impacted, and routes of exposure, are shown in Figure 8. The RAOs discussed below are media-specific (soil gas, soil, and groundwater) goals for protecting human health and the environment consistent with future land use described in the Master Plan. Future use of the Site will include commercial and may also include limited high density residential land use.

3.2.1 Soil Gas Remedial Action Objectives

COPCs in soil gas include VOCs and methane. The soil gas RAOs for protection of human health include:

- Prevent or minimize future site users' exposure to VOCs in soil gas exceeding appropriate screening levels through inhalation of VOCs volatilized from the subsurface into outdoor air.
- Prevent or minimize future site users' exposure to VOCs in soil gas exceeding appropriate screening levels through inhalation of VOCs volatilized from the subsurface into indoor air.
- Prevent or minimize construction workers' exposure to methane in trenches or excavations at concentrations exceeding 5% of the lower explosive limit (LEL) or 15% of the upper explosion limit (UEL).
- Prevent or minimize exposure future site users' exposure to methane via migration through building foundations into indoor air.

No RAOs were developed for ecological receptors' exposure to soil gas because there is little potential for significant exposure or impact to plant or animals from soil gas. Ecological receptors' potential exposure to soil gas, soil, and groundwater is discussed further in the Ecological Screening Level Risk Assessment (Section 8).

3.2.2 Soil RAOs

COPCs in soil include TPH, VOCs, PCBs, PAHs, metals, and NOA. The following RAOs apply to soil:

- Prevent or minimize human (commercial, recreational or residential site users, construction workers) and ecological receptors' contacting, ingesting, or inhaling soil and dust containing COPCs.
- Prevent or minimize COPCs from leaching from soil into groundwater.

3.2.3 Groundwater RAOs

COPCs in groundwater include TPH, VOCs, PAHs, and metals. The following RAOs apply to groundwater:

- Prevent COPC-contaminated groundwater from migrating into the San Francisco Bay.
- Protect ecological and recreational human receptors in the San Francisco Bay from ingestion of or dermal contact with COPC-contaminated groundwater.
- Prevent or minimize human (commercial, recreational or residential site users, construction workers) inhalation of VOCs (exceeding appropriate screening levels) that have volatilized from groundwater into outdoor or indoor air.

Groundwater at the Site is not considered a potential future source of drinking water. Total dissolved solids (TDS) concentrations in site groundwater range from 913 micrograms per liter (mg/L) to 42,000 mg/L and exceed the federal and state secondary maximum contaminant level (MCL) of 500 mg/L standards for drinking water (Water Board, 2008b).

The Water Board has agreed that shallow groundwater at the Site is not considered a viable potential drinking, industrial or irrigation source because:

- The aquifer is thin and limited in horizontal extent
- Generally has low to variable water production
- Generally high TDS, chloride content, salinity, specific conductance
- The close proximity to San Francisco Bay and degradation of water quality from salt water intrusion
- Due to paved surfaces minimal freshwater recharge occurs at the site
- The historic industrial use and placement of artificial fill has resulted in widespread contamination not from a single source
- The City and County of San Francisco prohibits the installation of domestic supply wells and obtains a high quality municipal water supply from the Hetch Hetchy watershed and plans to continue this use (Tetra Tech, 1999).

As a result, risk to human health through the drinking water exposure pathway will not be evaluated in the HHRA (Section 7).

3.3 Screening Levels

As discussed in Section 1.2, the Master Plan envisions a future land use program that includes open space, commercial properties, and limited high density residential development on Parcels 1 and 3. The primary exposure routes through which future site users might be exposed to COPC are inhalation of volatilized VOCs in outdoor and indoor air, and dermal contact with, and incidental ingestion of soil. The Water Board's ESLs (Water Board, 2008a) provide a conservative screening tool for assessing whether additional investigation, risk assessment, and/or remediation is warranted at a site. This site investigation used ESLs to screen the soil gas, soil, and groundwater data to identify potential areas of concern. The soil gas ESLs are intended for evaluating potential indoor-air impacts for the given land use (Table E-1). The soil ESLs are intended to address direct-exposure, groundwater protection, ecological, and nuisance concerns for shallow soils given the indicated land use where groundwater is not a potential source of drinking water (Table B). The groundwater ESLs are intended to address drinking water, surface water, indoor air and nuisance concerns (Table B). Risk-based target concentrations for human health protection will be developed as part of future evaluation of remediation and mitigation of potential health risks.

Ecological screening levels for soil include Water Board ESLs (Table A-2) which are based on urban area ecotoxicity criteria and US Environmental Protection Agency (USEPA) Region 5 RCRA Ecological Screening Levels (USEPA, 2003). Some potential contaminants lack published soil screening levels and for those contaminants, the ecological screening level was developed using the Racoon as the scientific model.

Ecological screening levels for groundwater discharge to the Bay are from the Water Board Marine ESLs for Surface Water Bodies (Water Board, 2008a) unless otherwise noted in the tables referenced in Section 8.0. Shallow groundwater discharge to the Bay is evaluated in the ESLRA.

3.4 Background Metals

Due to the long history of industrial and shipbuilding activities at the Site and the presence of serpentinite bedrock containing naturally occurring heavy metals at the surface and at shallow depths in the subsurface, this SI did not evaluate background or ambient levels of metals in soil. For comparison purposes only, background levels for soil and bedrock from similar sites are presented in Table 9 and discussed in Section 5. For arsenic in soil, 11.5 mg/kg was derived as a background concentration for the adjacent Potrero Power Plant property (AMEC, 2009). Ambient levels for metals in soil and in serpentinite bedrock developed for Hunters Point Shipyard (ERRG and Shaw, 2009 and T&R, 2004), Innes Avenue located south of the Site (Tetra Tech 2004), and for the Presidio (Presidio Trust, 2002) are also presented.

At Mission Bay located along the shoreline north of Pier 70, between 1869 and 1913, marshlands and tidal flats were filled with dirt and rock from the Second Street cut and serpentinite rock blasted from Irish Hill as well as rubble and debris from the 1906 earthquake (Environ, 1998). At Hunters Point Shipyard, located along the shoreline south of Pier 70, the widespread distribution of metals in soil is also related to the occurrence of these metals in the Franciscan Formation serpentinite bedrock that was quarried for fill during the expansion of the shipyard in the 1940s. As at Pier 70 and Mission Bay, these metals were distributed throughout the shipyard during periods of infilling. Although it is possible that some releases of these metals at Hunters Point Shipyard could have occurred from Navy activities, the range of concentrations is consistent with the range of concentrations in local bedrock. The resulting distribution of metals concentrations in soil is nearly random across Hunters Point Shipyard and the concentrations of metals in the bedrock fill sometimes exceed cleanup goals. Therefore, remedial alternatives to address these naturally occurring metals include containment beneath covers and institutional controls (ChaduxTt, 2007).

4.0 SITE INVESTIGATION APPROACH

The SI approach, field procedures and deviations from the Work Plan are presented in the following sections.

4.1 Phased Investigation Approach

In accordance with the Work Plan, the SI sampling was conducted using an iterative approach in two phases. Phase 1 was conducted to identify the presence of contamination in the potential source areas (presented in Section 2), and to close data gaps that exist for parcels at the Site where no environmental investigations have been conducted. Phase 2 was conducted to further delineate the nature and lateral and vertical extent of contamination found during Phase 1, and to collect sufficient data to complete the HHRA, ESLRA, waste characterization, FS and RMP. The sampling results were used to assess the presence or absence of COPCs in soil, soil gas and groundwater at each potential source area (Figure 6) and to characterize subsurface conditions across the Site.

T&R conducted Phase 1 activities during August through November 2009. Phase 1 activities included pre-investigation permitting and underground utility clearance; advancement of 62 exploratory borings and six test pit excavations; soil and grab groundwater sampling; installation, development and surveying of eight monitoring wells, groundwater monitoring well gauging and sampling; groundwater level fluctuation evaluation; soil gas sampling at 24 locations, and installation and sampling of six semi-permanent soil gas monitoring probes (Figure 9).

T&R reviewed the Phase 1 sampling results with the Port and Water Board, and prepared a Work Plan addendum dated 24 November 2009 describing the proposed Phase 2 investigation. The Water Board reviewed and approved the Phase 2 Work Plan addendum in the letter from the Water Board dated 7 December 2009.

Phase 2 activities were performed during December 2009 through April 2010. Phase 2 activities included pre-investigation permitting and underground utility clearance; advancement of 30 exploratory borings; and four test pit excavations; soil, grab groundwater, and NAPL sampling; installation of two additional monitoring wells; gauging and sampling 13 monitoring wells; and soil gas sampling at nine locations. Phase 1 and 2 sampling locations are shown on Figures 9 and 10, respectively. Phase 1 and 2 sampling tasks are summarized below and results are presented in Section 5.

The soil sampling program was designed to evaluate subsurface conditions by obtaining detailed lithologic descriptions of soil and rock encountered during drilling, collecting soil samples for geotechnical parameter testing, and collecting soil samples at sufficient depths and extent to define the lateral and vertical extent of COPCs.

The groundwater sampling program included collection of grab groundwater samples, and installation and sampling of monitoring wells to evaluate groundwater conditions at the Site. Soil and grab groundwater sampling results were evaluated to decide locations of Phase 1 monitoring wells. During Phase 1, eight groundwater monitoring wells were installed, developed, and sampled to further characterize potential impacts. Two additional monitoring wells were installed during Phase 2 at locations chosen based upon evaluation of Phase 1 and 2 investigation results. The 10 monitoring wells installed as part of this investigation were sampled during Phase 2 along with three pre-existing wells: two located in Crane Cove Park (GWDG3 and GWDG4) and one located in Slipways Park (MW-28A) as shown on Figure 10.

The soil gas sampling program was designed to evaluate the potential for vapor intrusion into buildings proposed for Site redevelopment. Soil gas probes that can be used for repetitive soil gas sampling were installed in former demolition debris and fill disposal areas to collect data required for closure in accordance with state regulations for disposal facilities. To assess appropriate soil gas sampling and soil gas probe installation depths, groundwater levels in two monitoring wells (CCMW-01 and SPMW-01) located near the shoreline were continuously monitored over one full tidal cycle to evaluate groundwater level fluctuation and choose appropriate soil gas sampling and soil gas probe installation depths.

T&R modified some activities or sampling locations proposed in the Work Plan based upon field conditions, and conducted investigation activities in addition to those proposed in the Work Plan, including collecting additional shallow soil samples, excavating test pits in Crane Cove Park, observing AMEC Geomatrix' (AMEC's) DNAPL investigation at Slipways Park, and sampling soil from borings advanced by AMEC. Additional activities and deviations from the Work Plan are discussed in further detail in Section 4.4.

4.2 Site-Specific Health and Safety Plan

A site-specific *Health and Safety Plan* was prepared by T&R as required by the Occupational Health and Safety Administration Standard "Hazardous Waste Operations and Emergency Response" guidelines (29 CFR 1910.120) and included in the Work Plan. The *Health and Safety Plan* was reviewed and signed by T&R personnel and subcontractors performing work at the site before field operations began.

4.3 Investigation Activities

The Phase 1 and 2 field investigation activities were conducted in accordance with the Work Plan and standard operating procedure (SOPs) and are described below. Sampling locations are shown on Figures 9 and 10.

4.3.1 Utility Location and Permitting

Prior to drilling, T&R obtained boring and monitoring well installation permits from the SFDPH. T&R notified Underground Service Alert (USA) at least 48 hours before beginning drilling or excavation of tes-pits and subcontracted California Utility Surveys of San Ramon, California, to identify and locate underground utilities at each boring, test pit and well location.

4.3.2 Direct Push Soil Borings

Vironex of Pacheco, California, advanced a total of 73 soil borings as shown on Figures 9 and 10 using direct-push drilling methods. Each boring was initially advanced 5 feet bgs using a hand auger to check for buried utilities. Borings were advanced to collect continuous soil cores to approximately 10 feet bgs (Photograph 1). Continuous soil cores were collected inside a sample barrel which was lined with 4-foot-long clear polyvinyl chloride (PVC) sample liner. The soil cores were visually logged by T&R personnel in general accordance with the Unified Soil Classification System (USCS) working under the supervision of a California professional geologist. Soil was screened for organic vapors using a calibrated Photoionization Detector (PID). Classification of the soil, PID readings, and visual observations were documented on field boring logs (Appendix A). After the final sample was collected, each soil boring was sealed with neat cement grout.

Generally, up to two soil samples from each boring were analyzed for COPCs (Tables 3 and 4). The soil samples were cut from the four-foot long soil core PVC liner. The ends of these samples were covered with Teflon sheets, capped at each end, labeled, and placed in a cooler, and submitted under chain-of-custody protocol to Curtis & Tompkins, Ltd. (C&T) of Berkeley, California, a California-certified analytical laboratory.

All non-disposable equipment used during drilling and sampling activities that could come into contact with the samples was thoroughly cleaned, before and after each use. Between sampling intervals, non-disposable materials were washed with non-phosphate detergent solution, rinsed with tap water to remove detergent, rinsed with distilled/deionized water, and air dried.

4.3.3 Hollow Stem Grab Groundwater and Soil Sampling

Twelve soil borings were advanced using hollow stem auger drilling methods to collect soil and grab groundwater samples (Figures 9 and 10). HEW Drilling Company, Inc. (HEW Drilling) of Palo Alto, California performed the hollow stem auger drilling using a CME-75 hollow-stem auger drill rig. The borings were advanced to a total depth of approximately 30 feet bgs, or to refusal, whichever was encountered first. Each boring was initially advanced 5 feet bgs using a hand auger to verify no buried utilities were present (Photograph 2).

The soil borings were sampled at 5-foot intervals and at notable lithologic changes. The samples were collected using a split-spoon sampler lined with three 2-inch diameter by 6-inch long stainless-steel sample tubes. Each soil sample was screened for VOCs using a PID and recorded on the boring log. Each soil boring was visually logged by T&R in general accordance with the USCS to identify the composition of the subsurface materials.

To obtain a grab groundwater sample, each soil boring was first advanced to approximately 5 feet below first encountered groundwater. A length of temporary ¾-inch-diameter PVC well casing with the lower 10-foot section comprised of well screen was placed within the hollow stem augers (Photograph 3). The augers were then retracted higher than the first encountered groundwater level to ensure that any light non-aqueous phase liquid (LNAPL) present would encounter the temporary well screen. Prior to grab groundwater sample collection, the depth to groundwater was measured and checked for the presence of LNAPL using an oil/water interface probe.

Grab groundwater samples were collected using both a peristaltic pump with disposable nylon down-hole tubing and a disposable bailer (for VOCs only). Groundwater was decanted into the appropriate laboratory-supplied containers and placed on ice until being delivered under chain-of-custody protocol to C&T. The list of constituents for which grab groundwater samples were analyzed is presented on Table 6. Water quality parameters (temperature, pH, conductivity, oxygen reduction potential, total dissolved solids, dissolved oxygen) were also monitored and recorded prior to sample collection using an inline flow through cell or hand held meter. Water quality parameters were not measured at borings that contained viscous NAPL due to risk of fouling monitoring instruments.

Soil samples were retained for chemical analysis from each hollow stem auger boring at approximately 5, 10, 15, 20, and 30 feet bgs (Tables 3 and 4). One stainless steel tube from the split-spoon sampler was retained at each desired depth interval. The ends of these samples were covered with Teflon sheets, capped, appropriately labeled, and placed in a cooled ice chest. The samples were submitted to C&T, under chain-of-custody protocol. Approximately two soil samples from each boring were analyzed for COPCs based on evidence of contamination and/or changes in lithology.

Additionally, specific soil samples along with the associated recorded drilling hammer blow counts were submitted to Moore Twining Associates, Inc. (Moore Twining) under chain-of-custody protocol for physical soil testing of geotechnical parameters as presented in Tables 3 and 5.

After the final sample was collected, each soil boring was sealed with neat cement grout. SFDPH observed grouting of select borings. For QA/QC purposes, equipment rinsate samples from non-disposable sampling devices were collected and analyzed as discussed in Section 4.6.2. Following decontamination outlined above, rinsate samples were decanted into the appropriate laboratory-supplied containers and placed on ice until being delivered under chain-of-custody (COC) to C&T.

4.3.4 Soil Gas Sampling

T&R investigated soil gas in accordance with the procedures presented in the Work Plan, and in accordance with the Department of Toxic Substances Control (DTSC), the California Regional Water Quality Control Board – Los Angeles Region (LARWQCB) guidance procedures titled "*Advisory – Active Soil Gas Investigations*" dated January 28, 2003, and the California Environmental Protection Agency *"Advisory Active Soil Gas Investigations*" dated March 2010. Based on the rationale provided in the Work Plan, soil vapor sampling was conducted within Parcels 1 through 6, 8, and 9 and Slipways Park. The soil gas investigation consisted of Phases 1 and 2 temporary soil gas probe installation and sampling, and installation and sampling of semi-permanent soil vapor probes.

4.3.4.1 Phase 1 Temporary Soil Vapor Probe Installation and Sampling

Transglobal Environmental Geochemistry (TEG) of Rancho Cordova, California installed 24 temporary soil gas probes between 26 and 30 October 2009 as part of the Phase 1 soil gas investigation (Figure 9). One planned probe location, P6SG-04 was not installed due to the presence of subsurface utilities. The probes were installed to depths ranging between 4 feet to 10 feet bgs. The exact soil gas sampling depths were dependent on field conditions such as depth to water and boring refusal due to bedrock.

The temporary soil gas probes were installed by advancing 1-inch diameter steel rods equipped with a retractable sampling tip using the truck-mounted hydraulic hammer. The probes were constructed as outlined on Figure A-103 and construction details are summarized in Table A-1.

TEG used their onsite mobile testing laboratory (mobile lab) to analyze soil gas samples collected from the probes between 28 and 30 October 2009. At a minimum, soil gas samples were collected from the temporary probe locations 30 minutes following the probe installation in accordance with the Work Plan. Prior to initiating the soil gas sampling across the site, the mobile lab performed a purge volume test at the first soil vapor sampling location (P6SG-03) to determine which purge volume yielded the highest results, as outlined in the DTSC/LARWQCB guidance. Soil gas samples were collected for chemical analysis after withdrawing one, three, and seven equivalent volumes of the sample tubing. Tubing volumes were calculated by multiplying the length of tubing by 6-foot tubing length and 0.6 cubic centimeters of gas/foot.

Based on the results of this purge volume test, the three sample tube purge volume was selected for sampling because this volume was reported to contain the highest concentrations and/or the highest number of detections.

The mobile lab collected soil gas samples after removing the selected purge volume of vapor, using a soil vapor syringe at each location. In addition, 1,1-difluoroethane was used as a tracer compound around the probe rods during sampling as a QA/QC measure to evaluate sample integrity as described in the Work Plan. The mobile lab analyzed soil gas samples for VOCs by EPA Method 8260B and methane by EPA Method 8015M.

The mobile lab analyzed three soil gas duplicate samples from probe locations P1SG-01, P2SG03, and P9SG-01 on 30 October 2009. The duplicate samples were collected in 1-liter Summa canisters equipped with a 200 cc regulator supplied by Calscience Environmental Laboratories Inc. (Calscience). Clean, dry, non-reusable tubing and connectors were used at each sample probe location for the duplicate sample collection. Immediately after sampling, soil gas samples were submitted to Calscience of Garden Grove, California, an offsite California-certified analytical laboratory for VOCs analyses by EPA Method TO-15 and methane gas by Southern Air Quality Management District (SCAQMD) 25.1M.

Following the completion of the soil gas sampling and on-site analyses, the temporary soil gas probe locations were abandoned by removing the tubing assembly and backfilling the borings with neat-cement grout.

4.3.4.2 Phase 2 Temporary Soil Vapor Probe Installation and Sampling

Based on the results of the Phase 1 soil gas sampling, the Phase 2 soil gas sampling was conducted on 8 and 11 January 2010 to further delineate Phase 1 locations where soil gas concentrations exceeded ESLs. The Phase 2 locations were also chosen to investigate areas where VOCs in grab groundwater results exceeded ESLs. Seven soil gas probes were proposed in the Work Plan addendum; however, three additional probes were installed for the following reasons:

- Parcel 6: Installation of soil gas probe P6SG-04 originally proposed for Phase 1 was relocated due to the presence of subsurface utilities and collected during Phase 2; and
- Parcel 8: Two soil gas probes designated P8SG-02 and P8SG-03 were installed to investigate the impact to soil gas from elevated concentrations of VOCs detected in soil samples collected in AMEC boring TGU-16.

Temporary soil vapor probes (Section 4.3.4.1) were installed following the same procedures and protocols used during Phase 1. Following the installation of the probes, subsurface conditions were allowed to equilibrate for at least 30 minutes prior to soil gas sampling. TEG collected duplicate soil gas samples in 1-liter Summa canisters following the same procedures and protocols used in the Phase 1 (Section 4.3.4.1). One duplicate soil gas sample was collected at location P2SG-05. TEG submitted soil gas samples to Calscience for VOCs analyses by EPA Method TO-15 and methane by SCAQMD 25.1M.

Following completion of soil gas sampling, the temporary soil gas probe locations were abandoned by removing the tubing assembly and backfilling the borings with neat-cement grout.

4.3.4.3 Semi-permanent Soil Vapor Probe Installation

TEG installed six semi-permanent soil gas probes in the areas where demolition debris and earthen and bedrock fill was placed to fill in the former slipways in Parcel 6 and Slipways Park (Figure 9). Each probe was installed by advancing a borehole using 1.0 or 1.5 inch stainless steel rods. A length of 1/8-inch diameter nyla flow tubing was threaded onto the top of a 1.5-inch long, 3/8-inch diameter stainless steel prefabricated soil gas screen implant. The assembly was placed into the boring through a steel rod. A sand filter pack was installed in the borehole annulus from the bottom to approximately 1/2 foot above and below the screened implant. A 1-foot-thick seal of dry bentonite chips was placed above the sand filter pack. A 2-foot thick seal of hydrated bentonite was placed on top of the dry bentonite to create a seal around the tubing to prevent ambient air intrusion into the soil-gas probe. The remaining annular space was filled with neat cement grout to ground surface. To protect the probe, a protective well monument box was set flush with the ground surface in neat cement grout. The probe tubes were secured by attaching a closed ball valve to the end of the tubing inside the well box.

The probes, designated P6SGP-01, P6SGP-02, SPSGP-01, SPSGP-02, SPSGP-03, and SPSGP-04 were installed on 28 and 20 October 2009 for subsequent quarterly monitoring. Soil gas probe construction details are presented in Table A-1.

4.3.4.4 Semi-permanent Soil Vapor Probe Quarterly Monitoring

TEG sampled the semi-permanent soil vapor probes on 24 November 2009 and 9 April 2010, after seven consecutive dry days to minimize interference from soil moisture in the unsaturated zone.

On 6 November 2009, TEG performed a purge volume test at semi-permanent probe location SPSGP-04 to determine which purge volume yielded the highest soil gas concentrations in the semi-permanent soil vapor probes, as outlined in the DTSC/LARWQCB guidance. The soil gas purge test involved purging the probe of one, three, and seven equivalent volumes of the sample tubing. Tubing volumes were calculated as described above in Section 4.3.4.1.

Based on the results of this purge volume test, a purge volume of three equivalent tube volumes was selected for sampling the semi-permanent probe locations. During each sampling event, following purging of the selected purge volume, TEG collected a soil gas sample in a 1 L Summa canister. Immediately thereafter, soil gas samples were submitted under COC to Calscience for VOCs analyses by EPA Method TO-15 and methane by SCAQMD 25.1M.

4.3.5 Soil Vapor Pressure Monitoring

Soil vapor pressure was monitored at two separate locations (P9SG-01 and P6SFP-02, Figure 2) during 4 to 9 November 2009 to assess potential effects of tidal fluctuations on soil vapor pressure, and determine whether fluctuations in soil vapor pressure would impact applicability of the Johnson/Ettinger vapor intrusion model to evaluate potential health risks associated with indoor air quality (Johnson and Ettinger, 1991). Both soil gas probes were located approximately 380 feet from the San Francisco Bay. Vapor pressure was continuously monitored at each location for five days using a TSI Velocicalc 9555 multifunction meter/data logger. Soil vapor pressure measurements are presented in Appendix C.

4.3.6 Monitoring Well Gauging and Sampling

Groundwater levels were measured in monitoring wells across the Site in October and December 2009 and March 2010. Water level measurements are presented on Table 6 and discussed in Section 5.3.3.

4.3.6.1 Groundwater Level Measurements

After well development and prior to sampling, groundwater was allowed to recharge into the wells for at least 48 hours. Prior to groundwater sample collection, the depth to groundwater was measured and checked for the presence of LNAPL and DNAPL using an oil/water interface probe.

To gauge tidal fluctuation, groundwater levels in two monitoring wells located near the shoreline were continuously monitored over a tidal cycle using Geokon® Model 4500 vibrating wire pressure transducers and automatic data loggers. Tide tables from a nearby station were reviewed to choose a monitoring period with significant tidal fluctuation. Transducers were placed in the wells CCMW-01 and SPMW-01 on 6 and 7 October 2009 for a period ranging between 48 and 72 hours and data was collected at 5-minute intervals during this period. The groundwater level data were graphed and compared with tide levels to determine the degree of groundwater level fluctuation at the Site. Water level measurements were also collected from all accessible Site wells during the tidal fluctuation survey. The tidal fluctuation observed was used to assess appropriate depths for soil gas sampling and soil gas probe installation and is discussed in Section 5.3.4.

4.3.6.2 Monitoring Well Installation and Development

Monitoring wells were installed to assess groundwater conditions. Locations for wells were selected based upon review and evaluation of grab groundwater and soil sampling results.

HEW Drilling advanced 10 well borings to depths ranging between 15 to 25 feet bgs. Each boring was initially advanced 5 feet bgs using a hand auger to verify no buried utilities were present. Soil samples were collected for lithologic description purposes if a monitoring well location was not near a previously logged soil boring. Samples were collected using a split spoon drive sampler at approximately 5-foot intervals. Well construction details are presented in Table 6 and Appendix A. Equipment decontamination and associated QA/QC were performed as described in the Work Plan.

Following installation, the wells were developed using surge and purge bailing methods to enhance hydraulic connection between the well and native formation. Groundwater field parameters (temperature, pH, conductivity, and turbidity) were measured and recorded on field logs throughout development. Development was continued until approximately 10 well casing volumes of water were removed from the monitoring well and field parameters showed stabilization.

4.3.6.3 Monitoring Well Sampling and Analysis

Monitoring wells were sampled using low flow purging and sampling techniques (T&R, 2009) to obtain a representative water sample from the formation. A YSI 556 flow through cell was used to measure water quality parameters (temperature, pH, conductivity, dissolved oxygen and oxidation reduction potential). Water quality parameters measured during purging were recorded on groundwater sampling forms (Appendix D). Samples were collected after the water quality parameters stabilized according to the Groundwater Monitoring SOP, (T&R, 2009). Samples were collected using both a peristaltic pump and by using disposable nylon downhole tubing and disposable bailer (for VOCs only) (Photograph 4). Groundwater was poured or decanted into the appropriate laboratory-supplied containers and placed on ice until being delivered under COC to C&T. The analytical suite for each monitoring well was chosen based on review of the grab groundwater and soil sample results from adjacent sample locations, Site operational history, and previous investigation results. The analytical results are presented in Section 5.6.

4.3.7 Test Pit Excavation

Engineering/ Remediation Resources Group, Inc. (ERRG) of Pacheco, California, advanced five test pits using an excavator at locations within the filled Slipways at the southeast portion of the Site (Figure 13) At each location, except for SPTP-05, soil was excavated laterally one bucket wide (approximately 3 feet) to a maximum depth of approximately 7 feet bgs, or refusal, whichever was encountered first (Photograph 5). Each test pit or trench was visually logged by T&R in general accordance with the USCS to identify the composition of the subsurface materials at each test pit with results recorded on a test pit log (Appendix A) (Photograph 6).

SPTP-05, located further inland at Slipways Park, was not excavated, but was instead cored through the top (ground surface) layer of approximately 18-inch thick concrete to evaluate the depth of the slipway surface beneath ground surface.

One to two soil samples were collected from each of the test pits (SPTP-01, SPTP-02, SPTP-03, SPTP-04, and SPTP-06). Each soil sample was collected in a 2-inch-diameter by 6-inch-length stainless steel tube directly from the excavation sidewall or excavator bucket. The ends of each sample tube was covered with Teflon sheets, capped at each end, appropriately labeled, and placed in an ice cooled chest. The samples were submitted to C&T, under chain-of-custody protocols. After sample collection, test pits were backfilled with excavated material and generally compacted using the excavator bucket.

4.3.8 Analytical Program

Samples were analyzed for COPCs associated with each source area as identified in Tables 3 and 4. The primary samples were designated as follows:

- Master Plan Parcel Number (P1),
- location (SB = soil boring, SG = soil gas),
- sequence number (1, 2, 3, …) and
- depth of the bottom of soil sample in feet below ground surface (4.5).
- grab groundwater samples were labeled after the soil boring with a "GW" and depth suffix.

For example, soil sample P1SB-01-10 was collected from the first soil boring location in Parcel 1 at 10 feet bgs. Grab groundwater sample P1SB-01GW(15) was collected from the first soil boring location in Parcel 1 at 15 feet bgs.

Analytical methods for soil and groundwater samples included:

- TPHg by EPA Method 8015 modified
- TPHd, and TPHmo by EPA Method 8015 modified with silica gel cleanup Method 3630
- BTEX by EPA Method 8260
- Methyl tert-butyl ether (MTBE) by EPA Method 8260
- PAHs by EPA Method 8270 SIM

- PCBs by EPA Method 8082
- LUFT 5 Metals (Cd, Cr, Ni, Pb, and Zn) by EPA Method 6010/6062
- Pesticides using EPA Method 8081
- Dioxins by EPA Method 1613

Soil samples collected using hollow stem auger methods (as discussed below) were also analyzed for the parameters in accordance with Article 22A of the Health Code:

- TPHg by EPA Method 8015 modified
- TPHd, and TPHmo by EPA Method 8015 modified with silica gel cleanup
- PAHs by EPA Method 8270 SIM
- VOCs (including BTEX and MTBE) by EPA Method 8260B
- PCBs by EPA Method 8082
- CAM 17 Metals by EPA Method 6010/6020
- Asbestos by Polarized Light Microscopy (PLM)
- Cyanide by EPA Method 4500
- pH by EPA Method 150.1
- Sulfide by EPA Method 9030B

Soil samples with elevated total metals concentrations were analyzed using the Waste Extraction Test (WET) where total metals exceeded the Soluble Threshold Limit Concentration (STLC) by 10 times or more. The STLC is the California hazardous waste threshold. If soluble metals exceeded the STLC then the sample was analyzed by the Toxicity Characteristic Leaching Procedure (TCLP), the federal Resource Conservation and Recovery Act (RCRA) criteria to evaluate if the results indicate the soil is a RCRA hazardous waste. The results of these additional analyses are required if soil is to be offhauled during construction only.

Soil gas sample analyses included the following:

- VOCs (including BTEX and MTBE) by EPA Method 8260 (mobile laboratory)

- VOCs by TO-15 (offsite, fixed laboratory)
- Methane by 8015M (mobile laboratory)
- Methane by SCAQMD 25.1 (offisite, fixed laboratory)

To further characterize the subsurface conditions, the following geotechnical analyses, soil samples collected from a portion of the borings advanced using hollow stem auger methods were submitted for:

- Total organic carbon (TOC) by the Walkley Black method
- Moisture content and bulk density by ASTM Method 2937
- Particle size by ASTM Method D-422
- Permeability by ASTM Method 2434 or D-5084
- Total Porosity by ASTM Method D-2974
- Atterberg Limits by ASTM Methods D-4313

4.3.9 Equipment Decontamination Procedures

To avoid cross contamination, all equipment used during investigation activities that could come into contact with the samples was thoroughly cleaned, before and after each use per the General Equipment Decontamination SOP presented in the Work Plan.

4.3.10 Waste Management

Soil and water generated during field activities (investigation-derived waste) were placed in 55-gallon drums, which were then sealed and labeled. Each drum of investigation-derived waste was labeled with the generator contact information, date, contents and source location. Drums were stored in a secure area on Parcel 2 (Figure 2). To characterize investigation-derived waste for disposal, soil samples were collected from the drums and analyzed using a 4 drum to 1 composite sample. Waste characterization samples were analyzed for COPCs as discussed in Section 4.3.8 and as required by disposal facilities. After waste characterization, the waste was transported by ERRG to an appropriate licensed facility for disposal.

4.3.11 Location Surveying

Upon completion of sample collection activities, exterior borings and test pits were located by T&R using Trimble Real-Time Kinematic (RTK) Global Positioning Satellite (GPS) equipment. The RTK GPS equipment allowed for near-survey level horizontal and vertical accuracies under favorable weather conditions. Groundwater monitoring wells and interior boring locations were surveyed by Chaudhaury and Associates, a licensed land surveyor to one/100th of a foot. Groundwater monitoring wells were surveyed for horizontal position, ground surface elevation, and top-of-casing elevation. All surveying was conducted in accordance with the Location Surveying SOP presented in the Work Plan. The horizontal coordinates are provided in the California State Plane Coordinate System, Zone 3, North American Datum of 1983 (NAD83) in units of US Survey Feet. The elevations are expressed in US Survey Feet and referenced to the North American Vertical Datum of 1988 (NAVD88). Survey coordinates can be found in Appendix E.

4.3.12 Cultural Resources Monitoring

Due to the Site's bayshore location, William Self Associates (WSA) provided a qualified archaeologist meeting federal criteria under 36 CFR 61 to monitor drilling, excavation, and soil sampling activities. The archaeologist completed daily monitoring logs, documenting all testing and sampling operations and all observations with regard to cultural materials or any other pertinent information. WSA prepared a summary memorandum describing the scope, location and results of the archaeological monitoring. The memorandum is presented in Appendix F and will be submitted to the State Office of Historic Preservation (SHPO), State Lands Commission (SLC), and the Northwest Information Center (NWIC) at Sonoma State University.

4.4 Deviations from Work Plan and Additional Activities

4.4.1 Soil and Grab Groundwater Sampling

Early refusal (refusal at less than the planned drilling depth) occurred due to encountering impervious fill material or bedrock during advancement of three hollow stem borings and 14 direct push borings (Figure 11). As a result, T&R was unable to collect soil and grab groundwater samples at proposed sampling depths at locations shown on Tables 3 and 4, and was also unable to install groundwater monitoring wells at two proposed well locations (P1SB-01 and P5SB-01). Additional soil and groundwater sampling deviations included the following:

- Ten shallow soil samples, in addition to those proposed in the Work Plan, were collected at a depth of approximately 1.5 feet bgs and samples were submitted for metals analyses to provide shallow soil metals concentration data for the HHRA.
- As part of Phase 2, groundwater level measurements and samples were collected from wells GWDG3 and GWDG4 located in Crane Cove Park north of Building 50 and from TMW-28A located in Slipways Park.
- In Crane Cove Park, four trenches (CCTP-01 through CCTP-04) were excavated to determine the depth and construction of the slipways in that area of the Site (Figure 13 and Photographs 7 and 8).

4.4.2 Soil Gas Sampling

All soil gas samples collected during Phase 2 were analyzed at an offsite laboratory, Calscience, Laboratories rather than an onsite mobile lab, due to the relatively low number of samples collected.

4.4.3 NAPL Sampling

To evaluate the mobility and distribution of NAPL observed at Parcel 9, additional samples were collected from selected Phase 1 and 2 boring locations (P9SB04, P9SB06, and P9SB10) where the presence of NAPL had been observed (Figure 11).

On 17 February 2010, soil borings P9SB06, P9SB04 and P9SB10 were advanced to a maximum depth of 15 feet bgs by Vironex using direct push drilling methods (Section 4.3.2). On 5 March 2010 soil boring P9SB-06B was advanced by HEW drilling using hollow stem drilling methods (Section 4.3.3) to a maximum depth of 20 feet bgs.

At each soil boring location, a temporary PVC well screen was inserted to depth into the open borehole to facilitate the collection of free-phase NAPL samples from the groundwater using Teflon bailer. NAPL was observed in soil at all three borings, however, samples could not be collected because the NAPL adhered to the sides of the bailer (Photograph 9). The PVC well screen was removed from the boring, and during removal T&R observed NAPL adhered to the outside of the screen. Using disposable nitrile gloves, the NAPL was transferred by hand from the exterior of the PVC into a 6 ounce glass jar (Photograph 10).

A total of seven soil cores (P9SB10-11-14.8, P9SB04-12-14, P9SB06-13-14.1, P9SB06B-14-15, P9SB06B-15.5-16.5, P9SB06B-17-18, P9SB06B-19-19.5) that contained potential NAPL were sealed, labeled, placed in a cooler with dry ice, and delivered under chain-of-custody protocols to PTS Laboratories (PTS) in Santa Fe Springs, California, for analyses and evaluation. The dry ice was used, at the request of the laboratory, to decrease the potential for migration of NAPL within the soil pores prior to analysis. PTS evaluated the cores using white and ultra violet light core photography to highlight and exhibit hydrocarbon fluorescence. T&R reviewed the soil core photographs and submitted samples from those that exhibited the most significant hydrocarbon fluorescence (P9SB10-11-14.8, P9SB04-12-14, P9SB06B-14-15, P9SB06B-15.5-16.5) for the following additional analyses:

- Grain and bulk density using American Petroleum Institute (API) 40
- Moisture content using ASTM D2216
- Porosity and effective porosity using API RP40 and nuclear magnetic resonance (NMR) methods
- Hydraulic conductivity using EPA Method 9100
- Pore fluid saturation using API RP 40.

Free-phase NAPL samples collected from P9SB-04, P9SB-06, and P9SB10 were submitted to PTS for oil print chromatographic and physical property analyses. Physical property analyses included the following:

- Viscosity using ASTM D 445
- Density using ASTM D1481
- Specific Gravity using API RP40.

Results are discussed in Section 5.4.6.

4.4.4 Potrero Power Plant Site Investigation Oversight and Sampling

During 20 to 23 November 2009, T&R observed drilling and collected soil samples during AMEC's field investigation to evaluate the presence of DNAPL associated with historic MGP operations at the Potrero Power Plant site, located along the southern Site boundary (Figure 11). The purpose of AMEC's investigation was to delineate the potential presence of DNAPL within the Bay Mud and overlying fill along the upland shoreline areas of the Site.

At each boring location a TarGOST probe was advanced with a CPT probe through the Bay Mud to bedrock to evaluate for the presence of DNAPL in soil. The CPT probe allowed for simultaneous collection of lithologic information. Prior to advancing the CPT/TarGOST probe, a direct push soil boring was advanced to the fill/Bay Mud interface. If DNAPL was observed in the soil cores, the direct push casing was left in place and the CPT/TarGOST probe was advanced through the casing to bedrock. An adjacent CPT/TarGOST probe was also advanced within the fill to the Bay Mud interface to confirm the presence of DNAPL.

T&R observed drilling and collected soil samples from AMEC direct push borings TGU-16, TGU-18, and TGU-23 (Figure 10). These borings were advanced to the fill/Bay Mud interface. AMEC staff collected one soil sample from TGU-24 at 1.5 feet bgs on 20 November 2009 and relinquished custody to T&R staff on 21 November 2010.

T&R also collected soil samples from borings TGU-16, TGU-18, TGU-23, and TGU-24 (Figure 11). Soil samples were submitted for metals, PAH, TPHg, TPHd, TPHmo, and VOC analyses. The results are discussed in Section 5.4.

4.5 Data Quality Objectives

The Data Quality Objective (DQO) development process guides the decisions and procedures for collecting and analyzing environmental samples and evaluating the results to ensure that overall project objectives are accomplished. The DQOs are qualitative and quantitative statements that:

- clarify the intended data use,
- define the type(s) of data needed to make the decision,
- identify the conditions under which data should be collected, and
- specify the tolerable limits on the probability of making a decision error due to data uncertainty EPA, 2000).

EPA guidance presents DQO development as a seven-step process. The seven-step DQO process for this project was presented in the Work Plan and reviewed and approved by the Water Board. The process included the following:

- **Step 1: State the Problem.** The nature and extent of contamination from specific upland source areas relative to appropriate screening levels (Section 3.1) was to be determined for the Site in sufficient detail to prepare a HHRA, ESLRA, FS and RMP.

- **Step 2: Identify the Decision.** The information to be gathered was to be used to evaluate remedial alternatives to address contamination at the source areas and to evaluate the effect the contamination will have on Site redevelopment.

- **Step 3: Identify Inputs to the Decision.** To prepare the HHRA, ESLRA, and FS soil, soil gas and groundwater sampling results were to be compared to screening levels for the Site. SI definitive data (fixed laboratory and mobile laboratory for soil gas) were used as input to the decision.

- **Step 4: Define Study Boundaries.** Soil, soil gas and groundwater samples from the Site were to be collected and analyzed for COPCs.

- **Step 5: Develop a Decision Rule.** If Phase 1 soil and groundwater samples exceed the screening levels, Phase 2 samples were to be collected and analyzed in sufficient density to delineate the horizontal and vertical extent of contamination. Areas with contamination above the screening levels were to be evaluated in the HHRA and ESLRA to establish appropriate remedial and risk management actions.

- **Step 6: Specify Limits on Decision Errors.** Analytical results of soil, soil gas and groundwater samples were to be validated in a manner consistent with the measurement quality objectives such as accuracy, precision, and representativeness. Duplicate groundwater and soil gas samples were collected at 10% of the total quantity of groundwater and soil gas samples collected. Duplicate soil samples are not practical to obtain due to Bay fill heterogeneity. Soil duplicate sample results would be highly variable and the relative percent difference would likely calculate greater than 50%. Therefore, soil duplicate samples were not proposed.

- **Step 7: Optimize the Design for Obtaining Data.** Phase 1 sampling was to be conducted where previous sample results indicate that COPCs are present or where known potential sources of contamination were historically present and to generally characterize conditions across the Site. Phase 2 sampling was to be performed to further characterize the horizontal and vertical extent of COPCs where Phase 1 results exceed screening levels. Monitoring wells were to be located in areas where Phase 1 soil or grab groundwater sample results exceed ESLs or to generally characterize conditions across the Site.

4.5.1 Data Quality and Uses

Soil and groundwater samples were collected from locations selected based on the objectives described above, and analyzed for the COPCs. Soil and groundwater grab samples were collected using both direct-push and hollow-stem auger sampling techniques. Monitoring wells were installed by hollow-stem auger drilling. Boring logs and well construction details are presented in Appendix A. Where previous soil sampling results detected COPCs or site operational histories indicated the potential for releases to have occurred, Phase 1 sample locations were placed near those features. Phase 2 sample locations and depths were situated to extend laterally beyond and vertically below Phase 1 samples where results exceeded screening levels. Phase 2 soil gas and groundwater grab samples were collected in areas where data gaps remained following Phase 1.

Groundwater samples were collected from new and existing monitoring wells during Phase 1 and 2. Monitoring well development and groundwater sampling logs are presented in Appendix D.

4.5.2 Data Quality Needs

The data quality needs for the project were defined through the following steps:

- Identifying the COPCs,
- Determining appropriate analytical levels, and
- Identifying the levels of concern and associated analytical detection limit requirements.

4.5.2.1 Identification of Site Contaminants

The Site contaminants are those associated with the historic shipbuilding and repair operations and other historic sources, and contaminants present in fill placed to construct the Site as outlined in Section 2.1. Historic activities involved the potential release of fuels (gasoline, diesel, and motor oil carbon ranges) and related VOC and PAH compounds. PCBs and metals are associated with industrial operations. Naturally occurring metals are present in the native serpentinite rock (As, Cd, Cr, Cu, Pb, Ni, Vd, and Zn) and in the fill created from the native rock.

4.5.2.2 Appropriate Analytical Level

The intended use of the data dictates the appropriate analytical level. Because the SI data will be used to evaluate risk and remedial alternatives, Level III (using EPA-approved procedures) data was considered definitive and appropriate, with 10 percent of the definitive data reported in Level IV (rigorous QA/QC protocols and documentation) format to meet data validation requirements.

4.5.2.3 Levels of Concern and Analytical Detection Limits

The DQOs for the COPCs were established at concentrations lower than the screening levels to ensure that the analytical methods are sufficiently sensitive to verify the extent of concentrations exceeding the screening levels. For some compounds and analytical instruments, the reporting limits (RLs) were above screening levels. It is not technically possible to change the instrument reporting limits (Goyette, 2010). To ensure that the DQOs were met, the laboratory (Curtis & Tompkins) reported all results to the method detection limit (MDL). If there was a detection in samples where the RL was greater than the screening level, the results were estimated and qualified with a "J" data qualifier flag. For these samples, the MDLs are noted on the data summary tables. For soil gas reporting limits are well below screening levels. Soil and groundwater analytical laboratory reports are provided in Appendix H. Soil gas analytical results are provided in Appendix I.

4.5.2.4 Data Quality Indicators

Data quality refers to the validity of a data set. The data quality associated with environmental data is a result of the sampling plan rationale, the sampling procedures, and the analytical methods and instrumentation used to measure analyte concentrations. The Work Plan was designed to ensure that data collected are of known and documented quality, and are useful for the intended purpose. Each data quality component has uncertainty and biases that can affect data quality. Any sources of uncertainty related to sampling were minimized by consistent use of the SOPs, including proper sample handling and transport. The analytical laboratory data quality were measured and evaluated in terms of precision, representativeness, completeness, and comparability parameters as presented in the Data Validation Summary Reports in Appendix J.

4.6 Quality Assurance and Quality Control (QA/QC)

Field QA/QC samples are collected to assess the quality of the sampling and analytical process, specifically the extent to which field conditions and sampling and transportation procedures might impact data quality, and to demonstrate the reliability and defensibility of the data. Field QC samples included source-water blanks, trip blanks, equipment rinsate blanks, and field duplicate samples. QA/QC sampling details for each sampling matrix are presented below.

4.6.1 Duplicate Samples

Field duplicate samples are two samples collected at the same time, from the same source at the same depth or sample location as the associated field sample. Field duplicates were submitted to the laboratory as separate samples ("blind"). Duplicates sample nomenclature was sequentially as DUP#-year-month-day (e.g., DUP1-2009-06-10, the first duplicate sample of the day June 10 2009). The primary sample and duplicate sample ID pairs were recorded in the field logs.

The purpose of collecting field duplicates was to assess the consistency of the overall sampling effort, including collection, transport, and analysis. The purpose of submitting blind duplicate samples was to assess the consistency or precision of the laboratory's analytical system. Field duplicates were collected at a frequency of one for every 10 soil gas and groundwater samples.

Phase 1 and 2 groundwater duplicate samples were analyzed by C&T. Phase 1 and Phase 2 soil gas duplicate samples were collected in 1 liter Summa canisters and submitted under chain-of-custody to Calscience Laboratories.

4.6.2 Equipment Rinsate Blanks

A maximum of one equipment rinsate blank (ERB) was collected per reusable sampling device per day. ERB sample nomenclature was sequentially as ER#-year-month-day (e.g., ER1-2009-06-10, the first ERB sample of the day June 10 2009). The ERB samples were collected following decontaminating the sampling device by pouring laboratory supplied blank water (deionized water) over the decontaminated sampler directly into the sampling container. The ERB samples were analyzed for the same parameters as the field samples that were collected with the sampling device.

4.6.3 Trip Blanks

The laboratory supplied 40-milliliter (ml) trip blanks comprised of laboratory deionized water with each shipment of VOC sampling containers sent from the laboratory. Trip blank sample nomenclature was sequentially as TRIP#-year-month-day (e.g., TRIP1-2009-06-10, the first trip blank sample of the day June 10 2009). One trip blank was included with each cooler containing field samples planned for VOC analyses.

4.6.4 Source Water Blanks

Source-water blanks were used to evaluate the quality of the water used for the last rinse in the decontamination process. The purpose of the source-water blank was to confirm that no contamination originating in the rinsing water was added to the sampling tools. The source-water blank consists of deionized water used for the final rinse, and is analyzed for the same analytical suite as the samples collected with the equipment. Source water sample nomenclature is sequentially as SW#-year-month-day (e.g., SW1-2009-06-10, the first source water sample of the day June 10 2009). Source-water blanks were collected at a frequency of one per sampling event involving reusable equipment, provided the same source of water was used for the final rinse. Multiple containers of the same lot number of deionized or distilled water were considered the same source.

4.7 Laboratory Results and Data Validation

Phase 1 and Phase 2 soil and groundwater samples were analyzed by C&T and validated by Data Val Inc. Phase 1 soil gas samples were analyzed by TEG's onsite mobile lab and Calscience's offsite laboratory in accordance with the Work Plan. Phase 2 soil gas samples were analyzed by Calscience as described in Section 4.4.2. The sampling and analytical program outlining the sample analytes and the test methods used are summarized in Tables 3 and 4.

4.7.1 Data Validation Procedures

The QA/QC samples described above were used to help validate laboratory data. Ten percent of the soil and groundwater data were submitted to Data Val, of Novato, California, a third-party data validation service company. The SI data packages were provided in EPA Level IV (rigorous QA/QC protocols and documentation) format to meet data validation requirements. Data deliverables underwent data validation prior to being imported into summary tables or graphical programs. The analytical laboratory data quality were measured and evaluated in terms of precision, representativeness, completeness, and comparability parameters. Data qualifiers prepared by the analytical laboratory and the data validation firm were included on soil and groundwater summary tables in this SI report.

Calscience laboratories performed internal quality control checks on analytical instruments and soil gas data for accuracy and completeness by ensuring that:

- Holding Times have not been exceeded;
- Sample preparation information is correct and complete;
- All associated QC checks are within established control limits and if not out of control forms are completed thoroughly explaining the cause and corrective action taken;
- QC data results such as method blanks, matrix spikes, matrix spike duplicates, laboratory duplicate samples, and surrogate recovery samples are reported with appropriate qualification, quantification, and clarification; and,
- Quantitative sample results are complete and correct.

TEG Laboratories performed internal quality control checks on the mobile analytical laboratory and soil gas data for accuracy and completeness by ensuring that:

- QC data results such as method blanks, laboratory duplicate samples, and surrogate recovery samples are reported with appropriate qualification, quantification, and clarification; and,
- Quantitative sample results are complete and correct.

4.7.2 Data Validation Results

Dataval, Inc. reviewed both the electronic and hard copy laboratory data for soil and groundwater grab samples and groundwater monitoring well samples for the Phase 1 and Phase 2 SI. Data Validation Summary Reports are presented in Appendix J. The reports include an evaluation of the following quality control data (where applicable) for each analytical method:

- Holding times
- Matrix spikes and matrix spike duplicates (MS/MSD)
- Laboratory blanks

- Laboratory control samples
- Laboratory duplicate samples
- GC/MS tunes
- Performance evaluation mix standards
- ICP interference check standards,
- ICP serial dilutions
- Initial calibrations
- Continuing calibration verification standards
- Internal standards
- Compound identification and quantification

The following data validation qualifiers used by DataVal and shown on our tables are from those recommended in the October 1999 document entitled, *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*:

J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample. *A minus sign (-) indicates the numerical value has a low bias due to surrogate recovery failure. A plus sign (+) indicates he numerical value has a high bias due to surrogate recovery failure.*
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification".
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ	The analyte was not detected in the reported sample quantitation limit. However, the reported quantitation limit is approximated and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Significant findings of the Phase 1 and Phase 2 data validation include the following:

- For the entire data set (combined Phase 1 and Phase 2), no samples were rejected.
- For the entire data set, a limited number of PCB (aroclor 1260), acetone, and 2-butanone concentrations were qualified with a low bias (J-). These data were evaluated to assess whether the

results were equal to or within 10% of screening levels. These qualified results could potentially be a false negative for exceeding the screening level because of the attributed low bias. The results of the evaluation identified occurrences are limited and were found only for soil matrix samples. The occurrences of soil sample results that could potentially exceed screening levels and the associated percent of the SI data set are:

- PCB, two of 61 samples (0.03%)
- acetone, two of 75 samples (0.026%)
- 2-butanone, one of 75 samples (0.013%)

Thus, the data qualified with low bias do not appear to represent significant screening level exceedances.

5.0 SITE INVESTIGATION RESULTS

The SI findings are summarized in this section including the physical setting; geology and hydrogeology; soil gas, soil, and groundwater analytical results and screening level exceedances; and free-phase petroleum hydrocarbons observed in soil and groundwater.

5.1 Site Conditions

5.1.1 Climate

San Francisco's climate is modified by the location of the City on the northern end of a peninsula, surrounded on three sides by the relatively cool waters of the Pacific Ocean and San Francisco Bay. Summertime in San Francisco is characterized by cool marine air and persistent coastal stratus and fog, with average daily high temperatures between 60°F and 70°F, and daily lows between 50°F and 55°F. Mornings typically begin overcast followed by clearing on the warmer bay side, but only partial clearing on the cooler ocean side. The summertime temperature gradient across the city is generally from northwest to southeast, with the warmer readings farthest from the coast and in the wind sheltered valleys east of the Coast Range bisector. These differences are enhanced further by a strong afternoon and evening sea breeze with speeds between 20 and 30 miles per hour that is a result of the temperature (and consequently pressure) difference between the Pacific Ocean and the interior valleys of California (Null, 1995). Winter temperatures in San Francisco are temperate, with highs between 55°F and 60°F and lows in the 45°F to 50°F range.

Rainfall from May through September is rare, with an aggregate of less than an inch, or only about 5 percent of the yearly average total of approximately 21.5 inches. Considerable moisture is due to drizzle when the marine layer deepens sufficiently. This is seldom enough to measure (i.e., less than 0.01 inch) on any given day, except along the immediate coast. Over 80 percent of San Francisco's seasonal rain falls between November and March, occurring over about 10 days per month. There is also considerable variation of annual precipitation amounts.

5.1.2 Surface Conditions

The ground surface elevation at Pier 70 ranges from below mean sea level (msl) in the shoreline portion of the Site to approximately 10 feet above msl inland. The majority of the Site is paved with asphalt or concrete with the exception of portions of Parcel 1, Crane Cove Park (Figure 2) and an area around the radio tower (Figure 4).

5.1.3 Subsurface Conditions

A boring completion summary is presented on Figure 11 and indicates early refusal at boring locations in the southwest portion of the Site where bedrock is present within 4 feet of the ground surface. Early refusal was also met in Parcel 1 at P1SB-01 due to the presence of concrete, and in Parcel 9 at P9SB-03, likely due to the presence of subsurface riprap that comprises the sea wall. Figure 11 also indicates that locations where oily residue was observed in soil, and where NAPL consisting of heavy degraded petroleum hydrocarbons were present in groundwater. The area potentially impacted by DNAPL from the adjacent Potrero Power Plant site is also shown in Figure 11. These findings are discussed in detail below.

5.1.3.1 Geology

The Site is located on the east side of the San Francisco Peninsula within the basin of the Coast Range Geomorphic Provinces (Mark Group, 1990). Alluvial and estuarine deposits from this basin are from the Pleistocene to Holocene ages, and consist of Bay Mud and Bay Sands (Mark Group, 1990). These deposits are underlain by Franciscan Formation. The prevalent rock type of the Franciscan formation is Serpentinite (Figure 12).

Based on the results of the SI and previous investigations, the subsurface materials beneath soils the Site consist primarily of four units: fill material, native clays and silts comprising the bay mud unit, weathered bedrock and/or native silts, sands, and gravels, and competent bedrock. These four units vary in depth and thickness throughout the Site as shown on Cross Sections A-A′, B-B′ and C-C′ (Figures 12 to 15). The maximum depth explored during this investigation was 29.5 feet bgs at boring P8MW-01/P8SB-01. Boring and test pit logs are included in Appendix A.

5.1.3.2 Fill

Fill material underlying the Site is heterogeneous, composed mostly of brown to black silty gravelly sands with discontinuous and varying amounts of crushed serpentinite bedrock and construction debris including wood, bricks, and concrete. Fill is generally 10 to 15 feet thick and increases in thickness towards San Francisco Bay (Figures 14 through 16). Maximum fill thickness (approximately 22 feet) was encountered in the southeast area of the Site in Slipways Park (Figure 16).

5.1.3.3 Bay Mud

Bay mud is encountered at depths ranging from approximately 5 and 25 feet bgs (Figures 14 through 16), is composed mostly of dark grey to dark brown clays and silts of low to high plasticity, and contains varying amounts of shell fragments and organic debris. The bay mud is encountered north and east of the historic 1869 shoreline (Figure 2), and increases in thickness towards San Francisco Bay (Figure 16).

5.1.3.4 Weathered Bedrock and/or Native Silts, Sands and Gravels

A weathered bedrock profile of varied thickness overlies competent, relatively unweathered bedrock at less than 5 to more than 45 feet bgs beneath the Site. Whereas most, if not all bedrock encountered during this investigation was weathered to some degree, a distinction was made between weathered bedrock and unweathered bedrock based upon drilling refusal, or where relatively unweathered bedrock was observed while drilling or sampling. Weathered bedrock at the Site is generally grey to light brown with extensive oxidation and discoloration, has low to moderate hardness, and is weak. Depending on the degree of weathering, it was difficult to distinguish between weathered bedrock and native clays, silts, sands, and gravels. For this reason, weathered bedrock is grouped with native clays, silts, sands, and gravels on Cross Sections B-B′ and C-C′ (Figures 15 and 16).

5.1.3.5 Bedrock

In the southeast portion of the Site, bedrock is encountered at depths ranging from 28 to 30 feet bgs near the shoreline to increasingly shallow depths moving east to west. The bedrock is quite shallow, 4 to 6.5 feet bgs, through virtually all of Parcel 5 and most of Parcel 6 (location labeled "early refusal" in Figure 11).

Bedrock encountered at the Site consists primarily of serpentinite, shale, and sandstone of the Mesozoic Franciscan Formation. The serpentinite at the Site is generally light green to brown, moderately hard, and moderately weathered. The sandstone is grayish, olive-brown, dark brown, or yellow-brown, and is moderately weak to moderately strong. Shale encountered is dark gray, and weak. Sandstone was encountered in Parcel 4 in boring P4SB-17 at a depth of 58 feet to maximum explored depth of 66.5 feet bgs, and shale was encountered in Parcel 4 in boring P4SB-18 at a depth of 22.5 to 28 feet bgs.

5.1.3.6 Geotechnical Paremeters

Geotechnical analyses were performed by Moore Twining on soil samples from hollow stem borings. Results are summarized in Table 5. Particle size (ASTM D-44) and Atterberg Limits analyses (ASTM D-4313) results were compared to field descriptions, and if appropriate, boring logs were modified to be consistent with the geotechnical testing results.

Hew Drilling advanced two borings (P4SB-17 and P4SB-18, Figure 10) using a mud rotary auger to 66.5 feet bgs to provide information regarding geotechnical conditions near Building 113. The boring logs are presented in Appendix A. The results of this investigation are summarized in the report titled *Building 113 Geotechnical Investigation* (T&R, 2010).

5.2 Test Pits

Test Pits were excavated in the former slipways of Crane Cove and Slipways Parks to characterize the subsurface material, assess the former slipways construction, and collect samples for chemical analysis.

5.2.1 Crane Cove Park

Crane Cove Park was occupied by Union Iron Works for shipbuilding beginning in 1900 and this use continued through 1950 with additional uses such as plating. Between 1958 and 1976, the slipways were filled.

Four test pits were advanced at Crane Cove within approximately 100 feet of the northern shoreline. The planar and cross sectional view of CCTP-01 through CCTP-4 are presented on Figures A-98 through A-100 in Appendix A. Lithologic conditions of CCTP-01 through CCTP-04 consisted of gravelly sands, sands, sandy silty gravels and silty sands. At CCPT-01 and CCTP-03 an 8 to 12 inch layer of sand blast material was present within the fill. Total depth of the unconsolidated fill material extended to approximately 4.5 and 6.0 feet bgs. Beneath the fill, two-foot wide timbers associated with the historical slip construction were present. In CPTP-01, the timbers ran east to west and were spaced approximately 5 feet apart throughout the entire length of the test pit. In CPTP-03, two foot timbers ran north south and were also spaced 5 feet apart. Beneath the timbers was Bay mud clays. In CCTP-01, CCTP-03 and CCTP-04 groundwater was encountered at approximately 7 feet bgs. Approximate locations of the soil samples collected for chemical testing are presented on Figures A-98 through A-100. Total depth of the test pits was approximately 8 feet bgs.

5.2.2 Slipways Park

The slipways at Slipways Park were developed starting in 1941 as part of the WWII shipyard expansion, and the area was also used for laydown and had a welding platform. In 1974, the slipways were filled and the area paved.

Five test pits were advanced within 150 feet of the eastern shoreline (Figure 13) Test pits were generally four feet long by three feet wide (Photograph 5 and 6). Lithologic conditions of SPTP-01 through SPTP-04 and SPTP-06 consisted of a variety of Bay fill material including sand, clayey sands, gravelley sands, glass, brick debris, and wood debris likely from former historic buildings located near the shoreline. The bottom of the former concrete slip was observed at each test pit location beneath the unconsolidated fill at depths ranging between 5.0 and 7 feet bgs. VOCs were not detected by a PID during the field screening of soil at any of the test pits. Test pit logs and approximate locations of the soil samples are presented on Figures A-92 through A-97 in Appendix A.

SPTP-05, located further inland at Slipways Park, was not excavated, but was instead cored through the top (ground surface) layer of approximately 18-inch thick concrete to evaluate the depth of the slipway surface beneath ground surface. Beneath the concrete was a void space to 8 feet bgs where water was encountered (Figure A-96). The bottom of the concrete slip was measured at 11 feet bgs. A groundwater sample was collected from the bottom of slipway.

5.3 Hydrology

The Site is bordered along its eastern boundary by the San Francisco Bay; no other surface water (i.e. streams, wetlands, or ponds) occurs at the Site. Storm water generally flows into storm drains that discharge to the City's combined sewer and storm water system rather then discharging into the Bay (*Port of San Francisco Storm Water Management Plan*, Port of San Francisco, December, 2003). Surface water ponding or overland flow was not observed during the SI.

5.3.1 Hydrogeology

The hydrostratigraphic units at the Site consist of the Vadose Zone and Shallow Zone. The vadose zone is the unsaturated zone above groundwater. The Shallow Zone is the uppermost groundwater at the Site, which occurs predominantly in the fill material (Georesource Consultants, 1990). Site geologic data indicates the shallow aquifer thickness to range between 2 and 12 feet (Figures 14, 15, and 16). Beneath the fill material, groundwater occurs in thin lenses of fine grained sands isolated within Bay Mud, and in colluvium deposits at the contact of Bay Mud and bedrock (Georesource Consultants, 1990) (Figures 15 and 16).

5.3.2 Groundwater Flow Elevations and Directions

During monitoring in October 2009, groundwater in the Shallow Zone wells was encountered at depths ranging between approximately 5 and 13 feet bgs (Table 6). Groundwater elevation contours are presented in Figure 17. Groundwater gradient varied between 0.0023 and 0.0033 ft/ft; flow direction varied across the Site, but generally flowed towards San Francisco Bay, with the exception of Crane Cove Park (Figure 17). Although the tide was ebbing during groundwater monitoring in October 2009, groundwater near CCMW-01 flowed inward towards the Site, away from the Bay. It appears that Crane Cove Park is not influenced by tides as directly as other shoreline areas at Pier 70.

During monitoring in March 2010, groundwater in the Shallow Zone wells was encountered at depths ranging between approximately 3 and 13 feet bgs (Table 6). Groundwater elevation contours are presented in Figure 18. Groundwater gradient ranged from 0.0026 to 0.005; flow direction varied across the Site, but generally flowed towards the San Francisco Bay, with the exception of Crane Cove Park near CCMW-01 (Figure 18). As in October 2009, groundwater near CCMW-01 flowed inward, away from San Francisco Bay, though the tide was out going at the time. This observation indicates that Crane Cove Park is not influenced by tides as directly as other shoreline areas at Pier 70.

5.3.3 Tidal Influence

Continuous groundwater level data were collected at CCMW-01 and SPMW-01 (Figure 9) on 6 and 7 October 2009 to assess tidal influence on groundwater level in order to choose appropriate soil gas sampling depths. Groundwater elevations were compared to tide levels for the Crissy Field Station located on the north side of the San Francisco peninsula. The Crissy Field tide data were corrected for Pier 70 by estimating that Pier 70 is located halfway between the Pier 22 and Hunters Point tidal stations (for which time corrections are available) and that high and low tide at Pier 70 occurs at the median time between high and low tide at the two stations. The groundwater and tide level graphs for SPMW-01 and CCMW-01 are included in Appendix G.

At SPMW-01, the groundwater level fluctuated approximately 1 foot between high and low tides on 6 and 7 October 2009 (Figure G-1). In 1989, tidal influence studies conducted at Slipways Park (near SPMW-01) measured a groundwater level fluctuation of 1.97 feet (Mark Group, 1989).

The CCMW-01 groundwater level did not show a definitive response to the tidal fluctuations (Figure G-2) The data for CCMW-01 contains anomalous decreases in water level that do not correspond with low tide during the measurement period. The reason for the anomalous decreases is uncertain, but one possibility may be interference caused by ground vibrations related to ship repair activities in nearby Parcel 9, or heterogeneity in the subsurface material may be influencing the groundwater flow.

5.3.4 NAPL in Monitoring Wells

As discussed in Section 4.3.6.1 the presence of free product was measured using an oil water interface probe, and, if found, the thickness was documented. Free phase NAPL was observed in monitoring wells

P9MW01 and P9MW02 during well installation and development, and water level measurement. At these locations, NAPL adhered to the oil water interface probe and a measurable layer of NAPL could not be discerned. However during groundwater sampling activities only a slight hydrocarbon sheen was observed in these wells. Free-phase NAPL did not flow into the monitoring wells.

5.4 Soil Analytical Results

Soil sample locations, depths, and concentrations are presented in Tables 7 to 16. Soil and groundwater laboratory analytical results are presented in Appendix H.

SI and historical results and ESL exceedances are illustrated on Figures 19 to 23. For the purpose of discussion, concentrations of COPCs in soil are compared with ESLs, and concentration ranges are reported for compounds not exceeding ESLs. However, the risk assessment establishes site-specfic concentrations against which concentrations of COPCs in soil were compared to evaluate the need for remediation or risk management measures. Soils results for Parcels 1 and 3 are compared to residential ESLs (non-drinking water source, RWQCB, 2008, Table B) as these parcels are identified as potential sites for future high density residential use. Soil sample results for all other parcels are compared to commercial ESLs (non-drinking water source, RWQCB, 2008, Table B) as those parcels are planned for commercial or recreational land use. All deeper sample results (>3 meters) are compared to the more stringent shallow soil ESLs to simplify discussion.

5.4.1 pH, Sulfide and Cyanide Results

Some soil samples collected using hollow stem auger methods were analyzed for sulfide, pH, and cyanide in accordance with Article 22A of the Health Code. The pH in soil samples collected from Crane Cove, Slipways Park, and Parcels 2, 3, 5, and 9 ranged between 6.4 and 10.6 standard units. Sulfide was not detected above the laboratory reporting limit (<10 mg/kg). Cyanide was detected in only one sample in Parcel 5 in P5SB-01 at 1.1 mg/L at 9.5 to 10 feet. Sulfide, pH, and cyanide results are presented in Table 13.

5.4.2 Soil Analytical Results 0 to 10 Feet

5.4.2.1 Parcel 1

In Parcel 1, metals, PAHs, and TPHd soil concentrations exceed ESLs. Metals exceeded the ESLs in five of six samples (Table 9) for one or more of the following metals and concentrations: arsenic (4 mg/kg), cadmium (1.9 mg/kg), cobalt (52 to 70 mg/kg), lead (890 mg/kg), mercury (1.8 mg/kg), nickel (1,200 to 1,600 mg/kg), vanadium (29 mg/kg), and zinc (3,300 mg/kg). With the exception of zinc, metal ESL exceedances described above were generally within range of soil and serpentinite bedrock background concentrations (Table 9). PAHs exceeded the ESLs in two of six samples (Table 8) for benzo(a)pyrene (0.077 to 0.24 mg/kg). TPHd exceeded ESLs in one out of six samples (Table 7) at a concentration of 150 mg/kg. TPH was detected within the following concentration ranges: TPHd, 0.36 to 150 mg/kg; TPHg, 0.053 to 0.091 mg/kg; and TPHmo, 2.1 and 190 mg/kg. One VOC (napthalene) was detected in one of four samples at a concentration of 1.7 µg/kg, which is less than the ESL (Table 10). PCBs and pesticides were not detected in any of the samples at concentrations greater than laboratory reporting limits (Tables 11 and 12).

5.4.2.2 Parcel 2

In Parcel 2, metals, PAHs, and TPHd exceeded ESLs. Metals exceeded the ESLs in 12 of 17 soil samples (Table 9) for one or more of the following metals: arsenic (4.5 to 23 mg/kg), cadmium (29 mg/kg), copper (1,600 to 8,300 mg/kg), chromium (790 mg/kg), lead (1,600 to 9,600 mg/kg), nickel (160 to 1,200 mg/kg), and zinc (710 to 11,000 mg/kg). All metal ESL exceedances were within range of soil and serpentinite background concentrations with the exception of one arsenic exceedance (23 mg/kg), eight lead, one cadmium (3.3 mg/kg), the copper and zinc ESL exceedances (Table 9). Chromium-VI was not detected in any of the samples at concentrations greater than laboratory reporting limits. PAHs exceeded the ESLs in seven of 16 samples (Table 8) for one or more of the following: benzo (a) anthracene (3.2 to 47 mg/kg), benzo(a)pyrene (0.17 to 45 mg/kg), benzo(b)fluoranthene (5.2 to 53 mg/kg), benzo(k)fluoranthene (1.8 to 17 mg/kg), chrysene (44 mg/kg), dibenzo (a,h) anthracene (0.69 to 7.5 mg/kg), fluoranthene (140 mg/kg), fluorene (16 mg/kg), indeno 1,2,3-cd pyrene (25 mg/kg), naphthalene (8.1 mg/kg), phenanthrene (130 mg/kg), and pyrene (100 mg/kg). TPHd exceeded ESLs in three out of 15 samples (Table 7) at a concentration ranging between 280 to 690 mg/kg. TPHmo exceeded ESLs in three out of 15 samples at a concentrations ranging between 500 and 1,600 mg/kg. TPH was detected within the following concentration ranges: TPHd 0.36 to 690 mg/kg, TPHg, 0.05 to

0.47 mg/kg; and TPHmo, 1.1 and 1,600 mg/kg. VOC and PCB concentrations did not exceed ESLs. One or more VOCs were detected in shallow soil at concentrations ranging between 2.2 and 30 µg/kg. PCB Aroclor 1260 was detected in one sample (Table 11) at a concentration of 16 µg/kg.

5.4.2.3 Parcel 3

In Parcel 3, metals, and TPHmo exceeded ESLs. Metals exceeded the ESLs in three of three samples (Table 9) for one or more of the following metals: arsenic (2.7 to 4.9 mg/kg), nickel (340 mg/kg), and vanadium (25 to 55 mg/kg). All metal ESL exceedances were within range of soil and serpentinite bedrock background concentrations. TPHmo (620 mg/kg) exceeded the ESL in one of three samples (Table 7). TPH was detected within the following concentration ranges: TPHd, 8.9 to 75 mg/kg, TPHg, 0.05 to 0.074 mg/kg; and TPHmo, 3.7 and 620 mg/kg. VOC concentrations did not exceed ESLs. Only one PAH, benzo(a)pyrene at 0054 mg/kg, exceeded the residential ESL. PAHs were detected in three of three samples (Table 8) collected at concentrations ranging between 0.0014 and 0.041 mg/kg. One or more VOCs were detected in one of one samples (Table 10) at concentrations ranging between 2.0 and 5.5 µg/kg. PCBs were not detected in any of the samples at concentrations greater than laboratory reporting limits (Table 11).

5.4.2.4 Parcel 4

In Parcel 4, metals, PAHs, and TPHd exceeded ESLs. Metals exceeded the ESLs in 17 of 25 samples (Table 9) for one or more of the following metals: arsenic (1.9 to 33 mg/kg), copper (2,500 mg/kg), nickel (160 to 1,400 mg/kg), and zinc (620 mg/kg). With the exception of one detection of arsenic, one detection of copper, and one detection of zinc, all ESL exceedances were within range of soil and serpentinite bedrock background concentrations. Chromium-VI was not detected in any of the shallow soil samples at concentrations greater than laboratory reporting limits. PAHs exceeded the ESLs in four of 21 samples (Table 8) for one or more of the following: anthracene (3.1 mg/kg), benzo(a)anthracene (3.1 to 6.6 mg/kg), benzo(a)pyrene (0.16 to 5.6 mg/kg), benzo(b)fluoranthene (6.3 to 8 mg/kg), benzo(k)fluoranthene (2.5 mg/kg), dibenzo(a,h)anthracene (0.97 to 1.4 mg/kg), indeno(1,2,3-cd)pyrene (2.7 to 4.1 mg/kg), and phenanthrene (12 mg/kg). TPHd exceeded ESLs in three out of 25 samples. TPH was detected within the following concentration ranges: TPHd, 0.26 to 280 mg/kg; TPHg, 0.058 to 33 mg/kg; and TPHmo, 0.78 and 1,200 mg/kg (Table 7). VOC, dioxin, and PCB concentrations did not exceed ESLs. One or more VOCs were detected in seven of 13 samples at concentrations ranging between 1.9 and 11 µg/kg (Table 10). Dioxins were detected in eight of eight samples (Table 14) at concentrations ranging between 0.00013 and 0.252 µg/kg. PCBs (Aroclor 1260) were detected in three of nine samples (Table 11) at concentrations ranging between 3.5 and 39 µg/kg. Pesticides were not detected in any of the samples at concentrations greater than laboratory reporting limits (Table 12).

5.4.2.5 Parcel 5

In Parcel 5, metals and TPHd exceeded ESLs. Metals exceeded the ESLs in six of 13 samples (Table 9) for one or more of the following metals: arsenic (2.3 to 4.1 mg/kg), chromium (920 mg/kg), nickel (180 to 1,600 mg/kg). Metal ESL exceedances were within range of soil and serpentinite bedrock background concentrations (Table 9). Chromium-VI was not present in any of the samples at concentrations greater than laboratory reporting limits. TPHd and TPHmo exceeded ESLs in one of 12 samples at concentrations of 1,100 mg/kg and 790 mg/kg, respectively. TPH was detected in 11 of 12 samples within the following concentration ranges: TPHd, 0.14 to 1,100 mg/kg; TPHg, 0.08 to 0.44 mg/kg; and TPHmo, 1.8 to 790 mg/kg (Table 7). PAH, VOC, PCB and pesticide concentrations did not exceed ESLs. PAHs were detected in nine of 12 samples collected at concentrations ranging between 0.0011 and 0.079 mg/kg. One or more VOCs were detected in three of seven samples at concentrations ranging between 1.2 and 25 µg/kg. PCBs (Aroclor 1260) were detected in one of seven samples (Table 11) at a concentration of 43 µg/kg. Pesticides were detected in one sample collected at concentrations ranging between 3.6 and 9 µg/kg (Table 12).

5.4.2.6 Parcel 6

In Parcel 6, metals, PAHs, TPHd, and cyanide exceeded ESLs. Metals exceeded the ESLs in five of 15 samples (Table 9) for one or more of the following metals: arsenic (2.1 to 660 mg/kg), copper (360 mg/kg), mercury (19 mg/kg), nickel (200 to 330 mg/kg), and zinc (710 mg/kg). All metal ESL exceedances With the exception of one nickel detection, metal ESL exceedances were above the range of soil and serpentinite bedrock background concentrations. PAHs exceeded the ESLs in one of 15 samples (Table 8) for benzo(a)pyrene (0.23 mg/kg). TPHd exceeded ESLs in two of 15 samples at concentrations ranging between 560 and 990 mg/kg. TPH was detected in all 15 samples and was reported within the following concentration ranges: TPHd 0.22 to 990 mg/kg; TPHg, 0.053 to 17 mg/kg; and TPHmo, 2.0 and 1,300 mg/kg (Table 7). VOC and PCB concentrations did not exceed ESLs (Tables 10 through 12). One or more VOCs were detected in eight of eight samples at concentrations ranging between 1.1 and 31 µg/kg. PCBs (aroclor 1260) were detected in three of eight samples (Table 11) at concentrations ranging between 2.3 and 220 µg/kg. Pesticides were not detected in any of the samples at concentrations greater than laboratory reporting limits.

5.4.2.7 Parcel 7

In Parcel 7, metals exceeded ESLs in three of four samples (Table 9) for one or more of the following metals: cobalt (110 mg/kg), chromium (1,200 to 1,300 mg/kg), and nickel (1,200 to 2,100 mg/kg). These metal exceedances are within range of soil and serpentinite background concentrations. TPHg, TPHd, TPHmo, PAH and VOC concentrations did not exceed ESLs. TPH was detected in four of the four samples within the following concentration ranges: TPHd 0.33 µg/kg to 1.5 mg/kg, TPHg, 0.072 mg/kg to 0.17 mg/kg; and TPHmo, 0.86 mg/kg and 2.5 mg/kg. One or more VOCs were detected in two of two samples at concentrations ranging between 2.1 and 2.7 µg/kg (Table 10). PAHs were not detected in any of the samples at concentrations greater than laboratory reporting limits.

5.4.2.8 Parcel 8

In Parcel 8, metals, PAHs, and TPHd exceeded ESLs. Metals exceeded the ESLs in four of seven samples (Table 9) for one or more of the following metals: arsenic (3.3 to 18 mg/kg), copper (400 to 730 mg/kg), lead (1,700 mg/kg), mercury (18 mg/kg), nickel (260 mg/kg), and zinc (780 to 1,100 mg/kg). With the exception of one arsenic exceedance 3.3 mg/kg all metal ESL exceedances were above the range of soil and serpentinite rock background concentrations. Chromium-VI was not detected in any of the samples at concentrations greater than laboratory reporting limits. PAHs exceeded the ESLs in four of six samples (Table 8) for one or more of the following: anthracene (3.1 to 7.7 mg/kg), benzo(a)anthracene (3.5 to 9.8 mg/kg), benzo(a)pyrene (3.9 to 7.2 mg/kg), benzo(b)fluoranthene (3.2 to 8 mg/kg), benzo(k)fluoranthene (1.8 to 3.4 mg/kg), dibenzo(a,h)anthracene (0.67 to 1.2 mg/kg), indeno(1,2,3-cd)pyrene(2.2 to 3.1 mg/kg), naphthalene (6.8 mg/kg), and phenanthrene (26 mg/kg). TPHd exceeded ESLs in two of five samples at concentrations ranging between (200 to 2,400 mg/kg). TPH was detected in four of five samples within the following concentration ranges: TPHd, 200 to 2,100 mg/kg; TPHg, 0.073 to 16 mg/kg; and TPHmo, 0.77 and 2,400 mg/kg. VOC concentrations did not exceed ESLs. One VOC (acetone) was detected in one of two samples at a concentration of 3.5 µg/kg. PCBs were not detected in any of the samples at concentrations greater than laboratory reporting limits.

5.4.2.9 Parcel 9

In Parcel 9, metals, PAHs, and TPHd exceeded ESLs. Metals exceeded the ESLs in 14 of 18 samples for one or more of the following metals: arsenic (2.6 to 10 mg/kg), copper (280 to 1,200 mg/kg), lead (2,800 mg/kg), nickel (160 to 620 mg/kg), and zinc (810 to 1,900 mg/kg) (Table 9). Arsenic, copper, lead and nickel ESL exceedances were within range of soil and serpentinite rock background concentrations. Chromium-VI was not detected in any of the samples at concentrations greater than laboratory reporting limits. PAHs exceeded the ESLs in 17 of 18 samples (Table 8) for one or more of the following: benzo(a)anthracene (6.2 mg/kg), benzo(a)pyrene (0.19 to 6.8 mg/kg), benzo(b)fluoranthene (8.7 mg/kg), benzo(k)fluoranthene (2.8 mg/kg), dibenzo(a,h)anthracene (1.2 mg/kg), indeno(1,2,3-cd)pyrene (3.7 mg/kg), naphthalene (5.5 mg/kg). TPHd exceeded ESLs in two of five samples at concentrations ranging between 750 and 8,800 mg/kg. One or more of TPHg, TPHd, or TPHmo was detected in four of five samples within the following concentration ranges: TPHd 0.66 to 8,800 µg/kg, TPHg, 0.045 to 35 µg/kg; and TPHmo, 3.1 and 1,800 µg/kg. VOC were detected in six of seven samples at concentrations below ESLs, ranging between 2.2 and 140 µg/kg (Table 10). PCBs (aroclor 1260) were detected below ESLs in one of six samples, at a concentration of 39 µg/kg (Table 11). Pesticides were not detected in any of the samples at concentrations greater than laboratory reporting limits.

5.4.2.10 Central Plaza Park

In Central Plaza Park, metals, PAHs, and TPHd exceeded ESLs. Metals exceeded the ESLs in five of nine samples (Table 9) for one or more of the following metals: arsenic (4.8 to 28 mg/kg), cadmium (7.5 mg/kg), copper (260 to 430 mg/kg), lead (1,100 mg/kg), mercury (13 mg/kg), and zinc (2,000 mg/kg). The cadmium, lead, mercury and zinc ESL exceedances and one arsenic exceedance were above the range of soil and serpentinite background concentrations (Table 9). PAHs exceeded the ESLs in four of nine samples (Table 8) for one or more of the following: benzo(a)anthracene (1.7 mg/kg), benzo(a)pyrene (0.17 to 3.1 mg/kg), benzo(b)fluoranthene (3.3 mg/kg), and dibenzo(a,h)anthracene (0.3 mg/kg). TPHd exceeded ESLs in three of nine samples at concentrations ranging between 230 and 2,700 mg/kg (Table 7). One or more of TPHg, TPHd, or TPHmo was detected in nine of nine samples within the following concentration ranges: TPHd 1.2 to 2,700 µg/kg, TPHg, 0.063 to 17 µg/kg; and TPHmo, 5.3 and 2,500 µg/kg. VOCs were detected in two of four samples at concentrations below ESLs, ranging between 2.5 and 9 µg/kg (Table 10). PCBs were not detected in any of the samples at concentrations greater than laboratory reporting limits.

5.4.2.11 Crane Cove Park

In Crane Cove Park, metals, PAHs, and TPHd exceeded ESLs. Metals exceeded the ESLs in eight of 14 samples (Table 9) for one or more of the following metals: arsenic (4 to 17 mg/kg), chromium (1,000 mg/kg), copper (390 to 480 mg/kg), nickel (220 to 1,500 mg/kg), and zinc (610 to 1,900 mg/kg). With the exception of one arsenic (17 mg/kg), copper and the zinc ESL exceedances, all metal ESL exceedances were within range of soil and serpentinite bedrock background concentrations. Chromium VI was detected in Crane Cove Park at concentrations ranging between 1.1 and 4.6 mg/kg. PAHs exceeded the ESLs in four of 11 samples for benzo(a)pyrene (0.18 to 0.45 mg/kg). TPHd exceeded ESLs in one of 11 samples (Table 7) at a concentration of 600 mg/kg. One or more of TPHg, TPHd, or TPHmo were detected in eleven samples within the following concentration ranges: TPHd 1.9 to 600 µg/kg, TPHg, 0.30 to 4.1 µg/kg; and TPHmo, 4.6 to 1,900 µg/kg. VOC and PCB concentrations did not exceed ESLs. VOCs were detected in one sample at concentrations ranging between 1.3 and 30 µg/kg. PCB Aroclor 1260 was detected in one sample (Table 11) at a concentration of 14 µg/kg. Chromium- VI concentrations in soil samples (Table 9) did not exceed ESLs.

5.4.2.12 Slipways Park

In Slipways Park, metals, PAHs, and TPHd-mo exceeded ESLs. Metals exceeded the ESLs in 22 of 28 samples (Table 9) for one or more of the following metals: arsenic (2.9 to 12 mg/kg), copper (250 to 350 mg/kg), nickel (350 to 610 mg/kg), and zinc (710 to 1,700 mg/kg). Five arsenic and all copper and zinc ESL exceedances were above the range of soil and serpentinite background concentrations (Table 9). Chromium-VI was not detected in any of the samples at concentrations greater than laboratory reporting limits. PAHs exceeded the ESLs in 18 of 27 samples (Table 8) for one or more of the following: benzo (a) anthracene (1.8 to 550 mg/kg), benzo (a) pyrene (0.16 to 730 mg/kg), benzo (b) fluoranthene (1.4 to 670 mg/kg), benzo (g,h,i) perylene (28 to 300 mg/kg), benzo (k) fluoranthene (7.5 to 200 mg/kg), chrysene (27 to 600 mg/kg), dibenzo (a,h) anthracene (0.34 to 46 mg/kg), indeno (1,2,3-cd) pyrene (23 to 260 mg/kg), naphthalene (6.1 to 540 mg/kg), phenanthrene (15 to 1,700 mg/kg), and pyrene (100 to 2,500 mg/kg). TPHd exceeded ESLs in 3 of 25 samples (Table 7) at concentrations ranging between 3,000 and 9,200 mg/kg. TPHmo exceeded ESLs in 2 of 25 samples at concentrations ranging between 3,500 and 4,400 mg/kg. TPHg was detected in 23 of 25 samples at concentrations ranging between 0.05 and 110 mg/kg. VOCs were detected in two of three samples at concentrations below ESLs, ranging between 1.2 and 6.9 mg/kg. PCBs were not detected in any of the samples at concentrations greater than laboratory reporting limits.

5.4.3 Soil Results Deeper than 10 Feet

5.4.3.1 Parcel 1

In Parcel 1, no soil samples were collected or analyzed deeper than 10 feet bgs due to the presence of obstructions in the subsurface.

5.4.3.2 Parcel 2

In Parcel 2, metals exceeded ESLs. In one sample, the arsenic concentration (33 mg/kg) exceeded the ESL (Table 9) and is above soil and serpentinite rock background concentrations. TPHd, TPHg, and TPHmo were detected in one sample at 0.69 mg/kg, 0.085 mg/kg and 8.9 mg/kg, respectively. One or more VOCs were detected in the sample at concentrations ranging between 1.6 and 9 µg/kg.

5.4.3.3 Parcel 3

In Parcel 3, metals and PAHs exceeded ESLs. Metals exceeded the ESLs in two deeper soil samples (Table 9) for one or more of the following metals: arsenic (2.7 to 4.1 mg/kg) and nickel (380 to 710 mg/kg). Both arsenic and nickel ESL exceedances are within range of soil and serpentinite bedrock background concentrations. PAHs exceeded the ESLs in one of two samples (Table 8) for benzo (a) pyrene (0.054 mg/kg). TPH was detected in two of the two samples within the following concentration ranges: TPHd 1.3 µg/kg to 20 µg/kg, TPHg, 0.057 to 0.074 µg/kg; and TPHmo, 3.7 µg/kg and 39 µg/kg. One or more VOCs were detected in two samples at concentrations below ESLS, ranging between 2 and 11 µg/kg (Table 10). PCBs were not detected in any of the samples at concentrations greater than laboratory reporting limits.

5.4.3.4 Parcel 4

In Parcel 4, no COPCs exceeded ESLs in soil sample collected from 10 feet bgs or deeper. Metals were detected at concentrations ranging between 0.0029 and 160 mg/kg (Table 9). TPHd, TPHg, and TPHmo were detected at concentrations of 20 mg/kg, 0.059 mg/kg and 12 mg/kg respectively (Table 7). VOCs, PAHs, and PCBs were not analyzed in samples deeper than 10 feet bgs at Parcel 4.

5.4.3.5 Parcel 5

No soil samples were collected deeper than 10 feet bgs in Parcel 5 due to the presence of bedrock near the ground surface (Figure 11).

5.4.3.6 Parcel 6

In Parcel 6, metals exceeded ESLs. Metals exceeded the ESLs for arsenic (60 mg/kg) in one soil sample (Table 9). This exceedance was above the range of soil and serpentinite bedrock concentrations. TPHg, TPHd, and TPHmo were detected in one sample at concentrations of 0.041 mg/kg, 11 mg/kg, and 16 mg/kg respectively (Table 7). One or more VOCs were detected in one sample at concentrations ranging between 3.8 and 21 µg/kg. PCBs were not detected in any of the samples at concentrations greater than laboratory reporting limits.

5.4.3.7 Parcel 7

No soil samples were collected deeper than 10 feet bgs in Parcel 7 due to the presence bedrock near the ground surface (Figure 11).

5.4.3.8 Parcel 8

In Parcel 8, metals exceeded ESL in one sample (Table 9) for one or more of the following metals: arsenic (4.7 mg/kg) and cadmium (16 mg/kg). The cadmium ESL exceedance was above the range of rock and serpentinite background concentrations. PAHs exceeded the ESLs in one of two samples (Table 8) for benzo(a)pyrene (0.52 mg/kg). One VOC (acetone) was detected in one of two samples at a concentration of 4.8 µg/kg. TPHg, TPHd, TPHmo, and PCBs were not detected in any of the samples at concentrations greater than laboratory reporting limits.

5.4.3.9 Parcel 9

In Parcel 9, metals, PAHs, and TPHd-mo exceeded ESLs. Metals exceeded the ESLs in 9 of 14 samples (Table 9) for one or more of the following metals: arsenic (3.6 to 8.5 mg/kg) and nickel (560 to 610 mg/kg). Both the arsenic and nickel exceedances were within range of soil and serpentinite bedrock background concentrations (Table 7). PAHs exceeded the ESLs in 5 of 16 samples (Table 8) for one or more of the following: acenaphthylene (14 mg/kg), anthracene (22 mg/kg), benzo(a)anthracene (2.3 to

33 mg/kg), benzo(a)pyrene (0.17 to 37 mg/kg), benzo(b)fluoranthene (3.2 mg/kg to 40 mg/kg), benzo(k)fluoranthene (13 mg/kg), chrysene (34 mg/kg), dibenzo(a,h)anthracene (0.45 to 5.7 mg/kg), fluoranthene (67 mg/kg), fluorene (12 mg/kg), indeno (1,2,3-cd)pyrene (15 mg/kg), naphthalene (4 mg/kg), and phenanthrene (69 mg/kg). TPHd exceeded ESLs (Table 7) in 9 of 16 samples at concentrations ranging between 330 to 7,900 mg/kg. TPHmo exceeded ESLs in 2 of 16 samples (Table 7) at concentrations ranging between 4,700 to 6,500 mg/kg. TPHg was detected in 15 of 16 samples at concentrations ranging between 0.063 and 140 mg/kg. One or more VOCs were detected at concentrations ranging between 1 and 30 µg/kg. PCBs were not detected above laboratory reporting limits in any of the samples (Table 11).

5.4.3.10 Slipways Park

In Slipways Park, metals, PAHs, TPHd-mo, and VOCs exceeded ESLs. Metals exceeded the ESLs in four of five samples (Table 9) for one or more of the following metals: arsenic (5.5 to 53 mg/kg) and copper (330 mg/kg). Two arsenic, one copper, and one vanadium ESL exceedances were above the range soil and serpentinite bedrock background concentrations. PAHs exceeded the ESLs in three of five samples (Table 8) for one or more of the following: acenaphthene (800 mg/kg), acenaphthylene (800 mg/kg), anthracene (7.1 to 850 mg/kg), benzo(a)anthracene (5.3 to 800 mg/kg), benzo(a)pyrene (0.67 to 1,200 mg/kg), benzo(b)fluoranthene (4.7 to 1,200 mg/kg), benzo(g,h,i)perylene (540 mg/kg), benzo(k)fluoranthene (1.5 to 370 mg/kg), chrysene (1,000 mg/kg), dibenzo(a,h)anthracene (0.52 to 79 mg/kg), fluoranthene (3,900 mg/kg), fluorene (400 mg/kg), indeno (1,2,3-cd)pyrene (2.3 to 510 mg/kg), naphthalene (8 to 2,300 mg/kg), phenanthrene (28 to 6,000 mg/kg), and pyrene (4,400 mg/kg). TPHd exceeded ESLs in two of five samples (Table 7) at concentrations ranging between 260 and 26,000 mg/kg. TPHmo exceeded ESLs in 1 of 5 samples (Table 7) at a concentration of 12,000 mg/kg. TPHg was detected in three of five samples at concentrations ranging between 0.61 and 15 mg/kg. One VOC (naphthalene) exceeded ESLs in one of three samples (Table 10) at a concentration of 86,000 µg/kg. PCBs were not detected in any of the samples at concentrations greater than laboratory reporting limits (Table 11).

5.4.4 Asbestos in Soil

Asbestos was detected in soil samples collected at Slipways Park and Parcels 3, 5, 6, and 9 at levels < 1%. Two samples collected at Parcel 2 contained asbestos at 2%. Asbestos was not detected in soil samples collected at Crane Cove Park or Parcel 8. Asbestos results are presented in Table 15.

Control of potential NOA emissions during future construction activities would be managed per Article 22A of the San Francisco Health Code and requirements of the following applicable regulations:

- California Code of Regulations (CCR) Title 17, Section 93105, the Asbestos Airborne Toxic Control Measure (ATCM) for Construction, Grading, Quarrying, and Surface Mining Operations
- BAAQMD Regulation 6, Particulate Matter and Visible Emissions
- City and County of San Francisco Order Number 171,378
- City of San Francisco Health Code Article 22B Construction Dust Ordinance

City Order 171,378 specifies a goal of no visible dust emissions from the Site and outlines housekeeping measures required to meet this goal. Article 22B of the San Francisco Health Code defines best management practices (BMPs) including wetting and seeding unpaved, inactive areas, minimizing activity during periods of high wind, sweeping paved areas, covering trucks, etc. Additionally, BAAQMD Regulation 6, which generally prohibits emission of visible dust beyond the property boundary, would also apply.

Because construction at Pier 70 may involve disturbance of areas with serpentine rock potentially containing naturally occurring asbestos (NOA), CCR Title 17, Section 93105 (ATCM) also applies. ATCM requires, among other things, submission of an Asbestos Dust Mitigation Plan for BAAQMD approval prior to grading activities where the area to be disturbed is over 1 acre.

5.4.5 Waste Characterization Results

The objective of the waste characterization sampling was to assist in the development of appropriate soil management and handling procedures potentially needed if soil is to be removed during future construction activities. Total metal concentrations detected in the soil were compared to state and federal criteria for hazardous waste and disposal options.

The total metal results were initially compared to the total threshold limit concentration (TTLC). Total metal results that exceed the TTLC are considered California hazardous waste. Approximately 35% of the soil samples with total metal concentrations greater than ten times the soluble threshold limit concentration (STLC) were analyzed for soluble metals using the California waste extraction test (WET) method. If the STLC result exceeded the California State Hazardous Waste criterion, the samples were analyzed using the federal toxicity characteristic leaching potential (TCLP) analysis. Approximately 20% of the samples were analyzed using TCLP analysis. These soluble metal analyses were run to assess if metal concentrations in soil were at State and/or Federal hazardous waste levels.

A summary of waste characterization results by parcel is described below.

Parcel 1

At boring locations P1SB-02, P1SB-03, and P1SB-04, chromium, lead, or nickel concentrations exceed the STLC California hazardous waste criterion in shallow soil (Table 16 and Figure 29). A total of two samples were analyzed for TCLP chromium, but soluble chromium was not detected above the laboratory detection limit of 0.05 mg/L (Table 16).

Parcel 2

At boring locations P2SB-03, P2SB-06, and P2SB-09, soil concentrations exceed the TTLC for copper, lead or zinc in shallow soil. The STLC for lead was exceeded at two boring locations (P2SB-01 from 9.5 to 10 feet bgs and P2SB-03 from 1.5 to 2.0 feet bgs).

Parcel 3

Metals detected in shallow and deep soil in Parcel 3 do not exceed the TTLC or STLC hazardous waste criteria.

Parcel 4

Metals detected in shallow and deep soil in Parcel 4 do not exceed the TTLC, STLC, or TCLP hazardous waste criteria.

Parcel 5

At boring locations P5SB-04, chromium and copper concentrations exceed the STLC in shallow soil from 4.0 to 4.5 feet bgs (Table 16 and Figure 29).

Parcel 6

Arsenic (660 mg/kg) exceeded the TTLC in one soil sample, P6SB-01-10.0. In shallow soil, lead exceeded the STLC California hazardous waste criterion at two boring locations, P6SB-01 and P6SB-02 (Table 16 and Figure 29).

Parcel 7

Nickel exceeded the TTLC at boring location P7SB-01 from 1.5 to 2.0 feet bgs. Chromium exceeded the STLC California hazardous waste criteria at the same location from 4.5 to 5.0 feet bgs.

Parcel 8

At boring location P8SB-02, the TTLC for lead was exceeded (Figure 29).

Parcel 9

In shallow soil, the TTLC for lead was exceeded at boring location P9SB-05 (Table 16).

Central Plaza Park

Metals detected in shallow soil at Central Plaza Park did not exceed TTLC or STLC hazardous waste criteria.

Crane Cove Park

The TTLC for lead was exceeded at one test pit location, CCTP-03. The lead STLC hazardous waste criteria was exceeded at boring locations CCSB-02 and CCSS-06 (Table 16 and Figure 29).

Slipways Park

Lead concentrations exceed STLC State hazardous waste criteria in one boring and two test pit locations, SPSB-04, SPTP-01, and SPTP-04 (Table 16 and Figure 29).

5.4.6 NAPL Characterization Results

5.4.6.1 Physical Properties

Physical and chemical property testing has provided data related to the potential NAPL mobility and recoverability. These properties included percent NAPL saturation in the soil, NAPL composition, viscosity, and interfacial tension. The PTS laboratory reports can be found in Appendix K.

Composition – A detailed hydrocarbon characterization summary is presented in Appendix K. Chemical analyses of NAPL samples from P9SB04, P9SB06, and P9SB10 indicate that the samples are complex mixtures of gasoline, diesel, fuel oils, and lubricating products. The chromatograms for each NAPL sample are not characteristic of current products of normal refinery distillation (Slentz, 2010). Based on the industrial history of Parcel 9, Bethlehem Steel's 1936 memo, and the presence of significant fuel oil storage, this chromatogram may represent a crudely refined product from 100 years ago. In the P9SB04 and P9SB06 samples, the light gasoline components (C4-C7) are highly degraded and have been weathered to low concentrations. In P9SB06, the composition is generally similar to P9SB04 and P9SB10, but contains less light gasoline compounds. The overall hydrocarbon profiles are quite similar but they are not identical in molecular weights of each carbon chain. Of the NAPL samples from P9SB04, P9SB06, and P9SB10, over 90% was composed of heavy diesel and fuel oil. This composition encompasses the carbon ranges from C10 to C36. In all three samples, less than 5% was composed of the lighter gasoline and kerosene compounds (C2 to C10). As shown in Photograph 9, the NAPL sticks to the PVC casing and appears to be highly viscous. These long-chained hydrocarbons typically adsorb onto the soil particles rather than dissolving into groundwater. In Fuel Oil No. 2, a known refinery petroleum distillate, the effective solubility of carbon chains of C_{12} and greater is essentially zero compared to compounds comprised of carbon chains of C_9 and less, such as napthalene and BTEX compounds (API, 2004). These results indicate that the NAPL is virtually insoluble in groundwater. In addition, the heavier carbon fractions in all three samples are less toxic to ecological and human receptors.

Specific gravity – Specific gravity is the ratio of the density of a substance to the density of water. At 70 degrees Fahrenheit (^{o}F), the specific gravity of NAPL P9SB04 and P9SB06 were 0.97 and 0.98, respectively. For comparison, the specific gravity of crude oil is 0.86, SAE 30 motor oil is 0.92, and water is 1.0 (Daugherty, 1985). The specific gravity values of the NAPL are similar to those of Fuel Oil No. 6 or Bunker C (API, 2004). These values also indicate that the immiscible phase NAPL is lighter than water; however, NAPL observed in the groundwater monitoring wells during development and water level measurement field activities was present in globules but was not present as a measurable floating layer.

Viscosity – Viscosity is the measure of a liquids internal resistance to flow. The viscosity of the NAPL samples from P9SB04 and P9SB06 were 11,515 centipoise and 5,682 centipose, respectively (at 70^{o}F). The viscosity of water at 70 ^{o}F is 1.002 centipoise (Daughtery, 1985). Field observations confirm that the NAPL is highly viscous, difficult to sample, and adheres to PVC, bailers and glass sample containers. The

NAPL viscosities are orders of magnitude higher than the viscosity of water. The extremely high NAPL viscosity indicates the NAPL is essentially immobile.

Interfacial Tension – Interfacial tension is the adhesive force between the liquid phase of one substance and the solid, liquid, or gas phase of another substance. The interfacial tension between the P9SB04-NAPL and P9SB06B-NAPL and tap water is 101 and 95.8 dynes per centimeter. This value is much higher than the tap-water and air interfacial tension of 73 dynes per centimeter. In general, a lower interfacial tension results in lower coalescence of the NAPL and greater mixing with the water. The higher interfacial tension indicates that NAPL adheres strongly to the soil particles.

Pore Fluid Saturation – The percentage of NAPL in the pore space varies in the soil cores collected from Parcel 9. The NAPL pore fluid saturation ranges from 6.7 % in P9SB06 at 15.95 feet bgs to 33.9 % saturation at P9SB10 at 11.9 feet bgs (Appendix K). The highest NAPL pore fluid saturations were observed in P9SB10 at 11.9 feet bgs and P9SB04 at 12.3 ft bgs at 33.9% and 32.2 %, respectively. In both of these borings the NAPL pore fluid saturation decreases with depth to 9.4% in P9SB10 at 12.9 ft bgs and 9.1% in P9SB04 at 13.65 feet bgs. It is unlikely with these low pore fluid saturations that NAPL would be mobile and migrate to the Bay.

5.4.6.2 NAPL Hydraulic Conductivity

PTS grain size analyses from boring P9SB10 at 12.0 and 13.0 feet, P9SB04 at 12.45 and 13.75 feet bgs, and P9SB06B at 14.05 and 16.25 feet bgs indicate the core samples that contain NAPL were composed of coarse grained sands and gravels (Appendix K, Particle Size Summary). The average hydraulic conductivity of this soil was 7.86 10^{-4} centimeter per second (cm/s) or 2.23 feet per day (ft/day). These coarse grained soils are representative of the Bayshore fill material. Beneath the fill is Bay Mud, the hydraulic conductivity of which would be significantly lower on the order of 4.0×10^{-6} cm/s or 0.01 ft/day to 0.001 ft/day (Bear, 1972).

Using the NAPL physical property data from borings P9SB04 and P9SB06 and the average horizontal hydraulic conductivity value (Kh aquifer) from borings P9SB-04, P9SB-06 and P9SB-12 the Kh of the NAPL was calculated as presented in Appendix K.

The average Kh NAPL value was 2.51×10^{-4} ft/day. This Kh NAPL value is three to four orders of magnitude less than Kh of the aquifer. The NAPL viscosities ranged between 5,509 and 11,514 centipoise (at 70°F) and the viscosity of water is approximately 1 centipoise. The NAPL viscosity is 5,000 to 11,000 orders of magnitude higher than viscosity of water. The high viscosity of the NAPL and low Kh NAPL values indicated that the NAPL is highly immobile.

5.4.6.3 NAPL Estimated Distance Traveled

Using the average Kh NAPL value from section 6.14.3, the estimated NAPL distance traveled was calculated using the formula presented in Appendix K.

The historical timeline at Parcel 9 indicates industrial activities and shipbuilding began at least 100 years ago. The 1936 memo from Bethlehem Steel indicates significant presence of oil in groundwater at that time. If we assume that historical petroleum hydrocarbon release from pipelines, USTs, ASTs or other sources may have occurred 100 years ago, the estimated NAPL distance traveled is 0.02 feet and that the NAPL is highly degraded and will continue to degrade over time. The estimated distance seems reasonable considering that NAPL has not been observed in wells located along the shoreline, in the general downgradient direction of groundwater flow from the NAPL area.

5.4.6.4 Mobility and Recoverability of NAPL

The NAPL at Parcel 9 appears to have very low mobility and limited potential for recovery from the subsurface. This conclusion is based on the following:

- High viscosity and specific gravity of the NAPL - The American Petroleum Institute (API) screening charts for recoverability were used to compare the viscosity of the NAPL at the Site to hydraulic conductivity values for product thicknesses ranging from 0.5 to 5 feet (API, 2004). Although a layer of NAPL thickness can not be measured at the Site, the viscosity values of 11,514 and 5,509 centipoise are so large that, based on comparison with values in the API chart, NAPL is unlikely to be recovered. This low recoverability is also likely considering the hydraulic conductivities of soils are 10^{-3} centimeters per second or less (API, 2004).

- Long-chained hydrocarbons in the NAPL – Fingerprint and carbon-fraction analyses indicate that most of the carbon chains are comprised of 12 carbon molecules (C_{12}) or greater. Because these long-chain hydrocarbons are non-polar, they have low solubilities and more readily adsorb onto soil. The solubilities of C_{12} to C_{44} compounds range between 0.0076 mg/L and 2.5 10^{-6} mg/L (API, 2001). The fact that napthalenes and BTEX were generally not detected in grab groundwater samples indicates low solubility (Tables 18 and 20). Results from the groundwater monitoring wells P9MW01 through P9MW04, in which TPHg, TPHd, and TPHmo were reported at very low concentrations also demonstrate that the NAPL is not present in dissolved phase (Table 24)

- Decreasing saturation with depth – The NAPL pore saturation decreases with depth at all three sample locations. This indicates that NAPL is likely trapped in the pore space of fill soils and is not migrating into the Bay.

- Low NAPL velocity - Mobility and recoverability of the NAPL is low; the estimated NAPL distance traveled in the last 100 years is 0.02 feet

- Monitoring wells installed in the core of a contaminated zone, with screening intervals across the water table, are generally the best tools to discern whether continuous free product, mobile free product, or both are present at a site (Charbeneau, 1999). Research on migration of free product concludes the following (Charbeneau 1999, Lenhard and Parker, 1990, Farr et al. 1990):
  - If LNAPL does not collect in properly installed monitoring wells during periods of low water levels, continuous LNAPL is not present, and any oil present is immobile residual.

5.5 Groundwater Grab Sample Results

Groundwater grab sample results are summarized in Tables 17 to 22 and illustrated on Figures 25, 26, and 27. Water Quality parameters measured in the field are summarized in Table 23. Maximum concentrations exceeding ESLs (non-drinking water source, Water Board, 2008, Table B) are presented below, as well as concentration ranges for compounds not exceeding ESLs. Grab groundwater samples collected were filtered in the lab and analyzed for dissolved metals. Dissolved metals results were compared to ESLs. PCBs were not detected in any of the groundwater grab samples (Table 22).

5.5.1 Parcel 1

No groundwater samples were collected at Parcel 1 due to subsurface obstructions.

5.5.2 Parcel 2

In Parcel 2 groundwater grab samples, dissolved metals, PAHs, and total cyanide exceeded ESLs. Dissolved metals exceeded the ESLs in four of five samples (Table 19) for one or more of the following metals: beryllium (0.62 µg/L), cobalt (4.4 to 5.4 µg/L), copper (8.9 to 10 µg/L), nickel (11 to 33 µg/L), selenium (5.9 to 8.7 µg/L), and silver (3.2 to 5 µg/L). PAHs exceeded the ESLs in two of five samples (Table 18) for one or more of the following: benzo(a)anthracene (0.9 µg/L), benzo(a)pyrene (1.2 µg/L), benzo(b)fluoranthene (0.03 to 1.1 µg/L), benzo(g,h,i)perylene (0.8 µg/L), chrysene (1.0 µg/L), dibenzo(a,h)anthracene (0.3 µg/L), indeno(1,2,3-cd)pyrene (0.6 µg/L), and pyrene (2.2 µg/L). TPHg, TPHd, TPHmo, and VOC concentrations did not exceed ESLs (Tables 17 and 20). One or more of TPHg, TPHd, or TPHmo were detected in all five samples at concentrations ranging between 12 and 67 µg/L. VOCs were detected in two of four samples at concentrations ranging between 0.1 and 1.9 µg/L.

5.5.3 Parcel 3

In Parcel 3, dissolved metals and PAHs exceeded ESLs. Dissolved metals exceeded the ESLs in one sample (Table 19) for P3SB-02GW: cobalt (16 µg/L) and nickel (27 µg/L). PAHs exceeded the ESLs in one sample (Table 18) for the following: benzo(a)anthracene (0.3 µg/L), benzo(a)pyrene (0.3 µg/L), benzo(b)fluoranthene (0.4 µg/L), benzo(g,h,i)perylene (0.2 µg/L), chrysene (0.4 µg/L), and indeno (1,2,3-cd)pyrene (0.2 µg/L). TPH and VOC concentrations did not exceed ESLs. TPHd was detected at 120 µg/L (Table 17). TPHg and TPHmo concentrations were not detected in any of the samples at concentrations greater than laboratory reporting limits. One VOC (carbon disulfide) was detected in one groundwater grab sample at a concentration of 0.3 µg/L (Table 20).

5.5.4 Parcel 4

In Parcel 4, PAHs exceeded ESLs. PAHs exceeded the ESLs in one sample (Table 18) for one or more of the following: benzo(a)anthracene (0.2 µg/L), benzo(a)pyrene (0.2 µg/L), benzo(b)fluoranthene (0.2 µg/L), and indeno (1,2,3-cd) pyrene (0.08 µg/L). TPH and VOC concentrations did not exceed ESLs. One or more of TPHg, TPHd, or TPHmo were detected in one sample at concentrations ranging between 27 and 160 µg/L. One VOC (methylene chloride) was detected in one groundwater grab sample at a concentration of 0.2 µg/L.

5.5.5 Parcel 5

No groundwater samples were collected in Parcel 5 due to the presence of bedrock near the ground surface (Figure 11).

5.5.6 Parcel 6

In Parcel 6, dissolved metals, PAHs, and total cyanide exceeded ESLs. Dissolved metals exceeded the ESLs in P6SB-02 (Table 19) for the following metals: cobalt (4.7 µg/L), copper (3.3 µg/L), mercury (0.17 µg/L), and nickel (8.5 to 8.7 µg/L). PAHs exceeded the ESLs in three of three groundwater grab samples (Table 18) for one or more of the following: benzo(a)anthracene (0.06 to 0.1 µg/L), benzo(a)pyrene (0.07 to 0.1 µg/L), benzo (b)fluoranthene (0.09 to 0.1 µg/L), and indeno(1,2,3-cd)pyrene (0.05 to 0.07 µg/L). Total cyanide exceeded the ESL in two of two samples (Table 21) at concentrations ranging between 10 and 20 µg/L.

5.5.7 Parcel 7

No groundwater grab samples were collected in Parcel 7. Soil borings met early refusal due to shallow bedrock and around water was not encountered.

5.5.8 Parcel 8

In Parcel 8, dissolved metals and total cyanide exceeded ESLs. Dissolved metals exceeded the ESLs in P8SB-01 (Table 19) for copper (3.2 µg/L) and lead (3.9 µg/L) (Figure 27). Cyanide exceeded the ESL in P8SB-01 (Table 21) at a concentration of 40 µg/L. PAH, TPHg, TPHd, TPHmo, and VOC concentrations did not exceed ESLs. PAHs were detected at concentrations ranging between 0.03 and 0.06 µg/L (Table 18). One or more of TPHg, TPHd, or TPHmo were detected at concentrations ranging between 11 to 13 µg/L. One VOC (acetone) was detected at a concentration of 1.8 µg/L (Table 20).

5.5.9 Parcel 9

In Parcel 9 groundwater grab samples, metals, PAHs, TPHg, TPHd, TPHmo, and total cyanide exceeded ESLs. Dissolved metals exceeded the ESLs in seven of seven samples (Table 19) for one or more of the following metals: barium (1,200 µg/L), cadmium (16 µg/L), cobalt (3.2 to 59 µg/L), copper (4.1 to 26 µg/L), lead (2.7 µg/L), nickel (10 to 69 µg/L), and zinc (3,100 µg/L) (Figure 27). PAHs exceeded ESLs in nine of 10 samples for one or more of the following (Figure 26): anthracene (0.9 to 7.3 µg/L), benzo(a)anthracene (0.5 to 7.5 µg/L), benzo(a)pyrene (0.7 to 2.8 µg/L), benzo(b)fluoranthene (0.08 to 8.6 µg/L), benzo(g,h,i)perylene (0.5 to 3.8 µg/L), benzo(k)fluoranthene (0.7 to 2.5 µg/L), chrysene (1 to 17 µg/L), dibenzo(a,h)anthracene (0.3 to 0.4 µg/L), fluoranthene (8.7 to 15 µg/L), fluorene (6.9 to 7.2 µg/L), indeno(1,2,3-cd)pyrene (0.4 to 1.4 µg/L), naphthalene (26 µg/L), phenanthrene (4.8 to 23 µg/L), and pyrene (5.2 to 17 µg/L). TPHg (470 to 7,000 µg/L), TPHd (560 to 180,000 µg/L), and TPHmo (470 to 150,000 µg/L) exceeded their respective ESLs (Table 17 and Figure 25). Total cyanide concentration (30 µg/L) exceeded the ESL in one sample (Table 21).

5.5.10 Central Plaza Park

In Central Plaza Park, dissolved metals, PAHs, TPHd, and TPHmo exceeded ESLs. Dissolved metals exceeded the ESLs in CPSB-01 for nickel (31 µg/L) and zinc (83 µg/L) (Table 19). PAHs exceeded ESLs in two samples for benzo (a) anthracene (0.2 to 0.5 µg/L), benzo(a)pyrene (0.3 to 0.5 µg/L), benzo(b)fluoranthene (0.3 to 0.5 µg/L), benzo(g,h,i)perylene (0.2 to 0.3 µg/L), chrysene (0.6 µg/L), and indeno(1,2,3-cd)pyrene (0.2 to 0.3 µg/L) (Table 18 and Figure 26). TPHd (410 to 8,200 µg/L) and TPHmo (440 to 8,200 µg/L) exceeded their respective ESLs (Table 17). TPHg was detected in one groundwater grab sample at a concentration of 75 µg/L and did not exceed the ESL (Table 17 and Figure 25).

5.5.11 Crane Cove Park

In Crane Cove Park, dissolved metals, PAHs, and TPHd-mo exceeded ESLs. Dissolved metals exceeded the ESLs in two of two samples for one or more of the following metals: cobalt (77 µg/L), copper (3.5 to 3.9 µg/L), lead (37 µg/L), nickel (61 µg/L), and zinc (100 µg/L) (Table 19 and Figure 27). PAHs exceeded ESLs in two groundwater grab samples for benzo (a) anthracene (0.06 to 0.1 µg/L), benzo(a)pyrene (0.04 to 0.1 µg/L), benzo(b)fluoranthene (0.05 to 0.2 µg/L), and indeno(1,2,3-cd)pyrene (0.09 µg/L) (Table 8). TPHd (880 to 990 µg/L) and TPHmo (610 to 1,100 µg/L) exceeded their respective ESLs. TPHg and VOC concentrations did not exceed ESLs (Tables 17 and 20). TPHg was detected in one of two samples at a concentration of 82 µg/L. VOCs (carbon disulfide and p-isopropyltoluene) were detected in one sample at 0.1 and 0.3 µg/L respectively.

5.5.12 Slipways Park

In Slipways Park groundwater grab samples, dissolved metals and PAHs exceeded ESLs. Dissolved metals exceeded the ESLs in both groundwater samples for one or more of the following metals: cobalt (16 µg/L), copper (5.3 to 6.7 µg/L), lead (5.8 to 7.7 µg/L), and nickel (9.3 to 12 µg/L) (Table 19 and Figure 27). PAHs exceeded ESLs in SPSB-04 for benzo (a) anthracene (0.6 µg/L), benzo(a)pyrene (0.7 µg/L), benzo(b)fluoranthene (0.9 µg/L), benzo(g,h,i)perylene (0.4 µg/L), chrysene (0.6 µg/L), and indeno (1,2,3-cd) pyrene (0.4 µg/L) (Table 18). TPHg, TPHd, and VOC concentrations did not exceed ESLs (Tables 18 and 20). TPHg and TPHd were detected at 9.6 and 36 µg/L, respectively (Table 17). TPHmo was not detected above laboratory reporting limits. VOCs were detected in SPSB-04 at concentrations ranging between 0.2 and 4.2 µg/L (Table 20).

5.6 Groundwater Monitoring Well Sample Results

Two separate monitoring well sampling events were conducted on 5 and 6 October 2009 and between 17 and 19 March 2010. Water Quality parameters measured in the field are summarized in Table 23. In October 2009, groundwater monitoring well samples were filtered in the lab and analyzed for dissolved metals. Based on comments from the Water Board, groundwater monitoring well samples were analyzed for both total and dissolved metals during the March 2010 sampling event. Maximum ESL (non-drinking water source, RWQCB, 2008, Table B) exceedance concentrations and concentration ranges for compounds not exceeding ESLs for the monitoring well samples are presented below. Both dissolved and total metal results were compared to ESLs. Sample results are summarized in Tables 24 to 27 and illustrated on Figures 25, 26, and 27.

5.6.1 Parcel 2

In Parcel 2 groundwater monitoring wells, metals exceeded ESLs in P2MW-01 for the following metals: total copper (10 µg/L), total lead (29 µg/L), total mercury (0.37 µg/L), and total zinc (100 µg/L) (Table 26 and Figure 27). PAH, VOCs, and TPH concentrations did not exceed ESLs. PAHs were detected at concentrations ranging between 0.02 and 0.2 µg/L (Table 25). TPHg was detected at concentrations ranging from 21 to 28 µg/L (Table 24). Acetone, a common laboratory contaminant, was the only VOC detected at 1.5 µg/L (Table 27).

5.6.2 Parcel 3

In Parcel 3 groundwater monitoring well P3MW-01, dissolved nickel exceeded ESLs at a concentration of 10 µg/L. PAHs, TPH, and VOCs did not exceed ESLs. PAHs were detected at a concentration of 0.02 µg/L. TPH was detected at concentrations ranging between 7.8 and 34 µg/L (Table 24). Methylene chloride, a common laboratory contaminant, was detected at 0.2 µg/L (Table 27).

5.6.3 Parcels 4, 5, 6, and 7

Monitoring wells were not installed in Parcels 1, 4, 5, 6, and 7 due to the shallow bedrock and lack of groundwater.

5.6.4 Parcel 8

In Parcel 8 groundwater monitoring well P8MW-01, dissolved copper (33 µg/L) exceeded the ESL (Table 26). PAH, TPH, and VOC concentrations did not exceed ESLs (Tables 24, 25, and 27). PAHs were detected at concentrations ranging between 0.08 and 0.2 µg/L. TPH was detected at concentrations ranging between 14 and 29 µg/L (Table 24), and two VOCs (carbon disulfide and chloroform) were detected at 0.1 µg/L (Table 27).

5.6.5 Parcel 9

In Parcel 9 groundwater monitoring wells, metals exceeded ESLs in three of 7 samples for the following metals: total cobalt (13 µg/L), total mercury (0.042 µg/L), total nickel (18 µg/L), dissolved copper (5 µg/L) (Table 26). PAHs, TPH, and VOC concentrations did not exceed ESLs. PAHs were detected at concentrations ranging between 0.02 and 1.3 µg/L (Table 24). TPH was detected at concentrations ranging between 22 and 130 µg/L. VOCs were detected at concentrations ranging between 0.2 and 31 µg/L (Table 27).

5.6.6 Central Plaza Park

In Central Plaza Park, metals and PAHs exceeded ESLs in groundwater monitoring well CPMW-01. Arsenic exceeded ESLs at a concentration of 130 µg/L (Table 26 and Figure 27). This exceedance may be a result of low dissolved oxygen concentrations and reducing conditions in groundwater, which can mobilize arsenic concentrations in soil. PAHs exceeded ESLs for the following compounds: benzo (a) anthracene (0.05 µg/L), benzo (a) pyrene (0.04 µg/L), benzo (b) fluoranthene (0.06 µg/L) (Table 18). TPH did not exceed ESLs and was detected at a concentration ranging between 23 and 160 µg/L (Table 24).

5.6.7 Crane Cove Park

In Crane Cove Park groundwater monitoring wells, metals exceeded ESLs for the following metals: total lead (14 to 22 µg/L), and total nickel (8.5 µg/L) (Table 26 and Figure 27). PAHs, TPH, and VOCs did not exceed ESLs. PAHs were detected at concentrations ranging between 0.02 and 0.7 µg/L (Table 25 and Figure 26). TPH was detected at concentrations ranging between 8.6 and 140 µg/L (Table 24 and Figure 25). VOCs were detected at concentrations ranging between 0.2 and 0.6 µg/L (Table 27).

5.6.8 Slipways Park

In Slipways Park, metals and PAHs exceeded ESLs in groundwater monitoring wells SPMW-01 and TMW-28A. Dissolved cobalt in SPMW-01 exceeded ESLs at a concentration of 7.2 µg/L (Table 26 and Figure 27). PAHs in both wells exceeded ESLs for the following compounds: benzo(a)pyrene (0.1 µg/L), benzo(b)fluoranthene (0.1 µg/L), and pyrene (6.4 µg/L) (Table 25 and Figure 26). TPH and VOCs did not exceed ESLs.

5.7 Soil Gas Results

This section presents the analytical results for soil gas samples. Analytical results are summarized in Table 28 and Figure 28. Copies of laboratory reports are included in Appendix I. VOC results were compared to ESLs (Table E-2, May 2008) established to screen soil gas concentrations for the potential to pose a risk to indoor air quality. Soil gas results for Parcels 1 and 3 are compared to residential ESLs because those parcels are identified as sites with potential for high density residential development. Soil gas sample results for all other parcels are compared to commercial ESLs.

Methane results are compared to explosivity limits (5% at standard temperature and pressure) and California Code of Regulations Title 27[5], which apply to landfill gas at disposal sites. None of the soil gas samples collected contained methane at concentrations exceeding Title 27 or explosive limits.

5.7.1 Parcel 1

Soil gas samples were collected from four soil gas probes (P1SG-01, P1SG-02, P1SG-03, P1SG-04). Results of the analyses indicated:

- VOC concentrations did not exceed ESLs
- VOC detections ranged between 0.004 and 0.44 µg/L
- Methane detected at a maximum concentration of 16 µg/L or 0.002%

5.7.2 Parcel 2

Soil vapor samples were collected from six soil gas probes (P2SG-01, P2SG-02, P2SG-03, P2SG-04, P2SG-05, P2SG-06). Results of the analyses indicated:

- Benzene was detected at a maximum concentration of 0.83 µg/L, above the ESLs
- TPHg was detected at 4,400 µg/L, above the ESLs
- Methane detected at a maximum concentration of 780 µg/L or 0.12%

5.7.3 Parcel 3

Soil vapor samples were collected from one soil gas probe (P3SG-01). Results of analyses indicated that VOC and methane concentrations were below laboratory reporting limits.

5.7.4 Parcel 4

Soil vapor samples were collected from six probes: P4SG-02, P4SG-04, P4SG-05, P4SG-07, P4SG-08, P4SG-09. Results of the analyses indicated:

- VOC concentrations did not exceed ESLs

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[5] The concentration of methane gas must not exceed 1.25 % by volume in air within any portion of any on-site structures. The concentration of methane gas migrating from the disposal site must not exceed 5% by volume in air at the disposal site, permitted facility boundary, or an approved alternative boundary

- VOC detections ranged between 0.036 and 1.0 µg/L
- Methane detected at a maximum concentration of 4.8 µg/L or 0.00073%

5.7.5 Parcel 5

Soil vapor samples were collected from four soil gas probes (P5SG-01 through -04). VOCs and methane concentrations were below laboratory reporting limits, with the exception of toluene which was detected at a concentration of 0.2 µg/L.

5.7.6 Parcel 6

Soil vapor samples were collected from three soil gas probes (P6SG-02 through -04). Results of the analyses indicated:

- VOC concentrations did not exceed ESLs
- VOC detections ranged between 0.0031 and 0.12 µg/L
- Methane was not detected above the laboratory reporting limit

5.7.7 Parcel 8

Soil vapor samples were collected from three soil gas probe (P8SG-01 through -03). Results of the analyses indicated:

- Naphthalene detected at a maximum concentration of 0.44 µg/L, above the ESL
- Methane detected at a maximum concentration of 12 µg/L or 0.0018%

5.7.8 Parcel 9

Soil vapor samples were collected from six soil gas probes (P9SG-01 through -06). Results of analyses indicated:

- VOC concentrations did not exceed ESLs
- VOC detections ranged between 0.0036 and 0.61 µg/L
- Methane detected at a maximum concentration of 1,000 µg/L or 0.15%

5.8 Semi-Permanent Soil Vapor Probe Sampling Results

Soil vapor samples were collected in four sampling events between November 2009 and October 2010 from semi-permanent soil gas monitoring probes in Parcel 6 and Slipways Park. The results are discussed below.

5.8.1 Parcel 6

Soil vapor samples were collected from two semi-permanent soil gas monitoring probes (P6SGP-01 and P6SGP-02). Results of analyses indicated:

- VOC concentrations did not exceed ESLs; with the exception of one detection of naphthalene (0.26 µg/L) reported in P6SGP-01 during the October 2010 sampling event.
- VOC detections ranged between 0.0031 and 0.26 µg/L
- Methane was detected at a maximum concentration of 1,200 µg/L or 0.18%

The maximum methane concentration detected at the Site is 1,200 µg/L at semi-permanent vapor probe P6SGP-01. This maximum methane level detected at 0.183 % is well below the 1.25% for protection of indoor air quality in overlying structures, and well below the 5% LEL limits in Title 27, Section 20921.

5.8.2 Slipways Park

Soil vapor samples were collected from four semi-permanent soil gas monitoring probes (SPSGP-01 through -04). Results of analyses indicated:

- VOC concentrations did not exceed ESLs
- VOC detections ranged between 0.0040 and 0.68 µg/L
- Methane was detected in samples from SPSGP-01 and SPSGP-04 during the third and fourth quarters of 2010 at concentrations ranging between 1.3 and 4.3 µg/L or 1.98 x 10^{-5} and 6.6 x 1^{-4} %.

5.9 Vapor Intrusion from Groundwater Sources

None of the groundwater samples collected during this SI contained VOCs or SVOCs at concentrations greater than the ESLs for vapor intrusion.

5.10 Soil Vapor Pressure Monitoring Results

Soil vapor pressure was continuously monitored for a period of five days at soil gas probes P9SG-01 and P6SGP-02 (Figure 9). The monitoring was performed to evaluate whether tidal influences on soil vapor pressure would to invalidate applicability of the Johnson/Ettinger vapor intrusion model at the Site (Johnson and Ettinger, 1991). Both soil vapor probes are located approximately 380 feet from the San Francisco Bay. Figures D-1 and D-2 present the soil vapor pressure changes during the five day monitoring period (Appendix D). Soil gas probe P9SG-01 had an average (± standard deviation) soil vapor pressure of 0.004 ± 0.002 inches of water (in H_2O) and soil vapor pressure ranged from -0.016 to 0.018 in H_2O. Soil gas probe P6SGP-02 had an average (± standard deviation) soil vapor pressure of 0.005 ± 0.005 in H_2O and soil vapor pressure ranged from -0.019 to 0.022 in H_2O. The measured fluctuations in soil vapor pressure at both locations were small and would not create soil vapor pressure changes that would be expected to invalidate the Johnson/Ettinger vapor intrusion model assumptions (Johnson and Ettinger, 1991).

5.11 Field QA/QC Results

The results for QA/QC samples are discussed below and summarized in Tables 29 and 30.

5.11.1 Equipment Rinsate Blanks

- VOCs detected in equipment rinsate blanks include acetone, methylene chloride, methyl ethyl ketone (MEK), and toluene. The detected concentrations were all below reporting limits with the exception of acetone, which was detected in one rinse blank at a concentration of 12 µg/L.
- Dissolved metals were detected in all rinsate blanks at concentrations below and above reporting limits. Metals detected include arsenic, barium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc.
- Sulfide was detected in one rinsate blank at a concentration of 0.06 mg/L.
- TPHd or TPHg were detected in 18 of 20 rinsate blanks at concentrations below reporting limits.
- Fluoranthene, naphthalene, pyrene, and phenanthrene were detected in 19 of 20 rinsate blanks at concentrations below reporting limits.

- PCBs, TPHmo, and cyanide were not detected in rinsate blanks.

Acetone, methylene chloride, and MEK are typical laboratory contaminants. According to C&T, the low detections of various other compounds in the rinsate samples could be from the following:

- Instruments at the lab use a flame ionization detector (FID), the detector can cause instrument interference;
- It is difficult to completely clean the FID detector, low residual chemical concentrations may be present in the instrument;
- Many detections were reported to the MDL and below the RL calibration curve, these concentrations are quantitatively so low that it could easily be a result of instrument interference, and these results are J flagged (Section 4.5.2.3).

5.11.2 Trip Blanks

Trip blanks (40-ml VOAs filled with laboratory DI water) were supplied by C&T and were analyzed for VOCs. Five trip blank samples had trace detections of chloroform or methylene chloride. Methylene chloride is a common laboratory contaminant. Chloroform may be present in laboratory supplied distilled (DI) water when a laboratory's deionization equipment does not completely remove chloroform during deionization. One trip blank reported low detections of TPHg and toluene below the laboratory reporting limit. These detections reported below the RL and above the MDL may be indicative of instrument interference and are estimated concentrations. In addition, low concentrations of toluene are typically reported in ambient air which may affect the sample results. The overall quality of the data should not be impacted by these low detections (Goyette, 2010).

5.11.3 Source Water Blank

The source water blank sample (SW1-2009-09-11) had trace detections of acetone, chloroform, methylene chloride, TPHd, aldrin (pesticide), and dioxins/furans. Acetone and methylene chloride are commonly used solvents in the laboratory, and detections of these compounds are attributable to potential laboratory cross-contamination. Chloroform may be present in laboratory supplied DI water when a laboratory's deionization equipment does not completely remove chloroform (commonly found in municipal supply water) during deionization and is likely the reason for the chloroform detection in the source water blank. TPHd (16 µg/L), and aldrin (0.01 µg/L) detections in the source water blank are attributable to laboratory cross contamination, as explained verbally by Micah Smith of C&T on 10 May 2010. PCBs, TPHg, TPHmo, and cyanide were not detected in the source water blank sample.

6.0 NATURE AND EXTENT OF IMPACTS

The following summarizes the nature and extent of Site wide impacts.

6.1 Soil

6.1.1 TPH

TPH in shallow soil exceeds ESLs at a small number locations within each parcel with the exception of Parcel 7, where TPH was not found at concentrations above the ESL (Figure 19). TPH exceedances are likely associated with fill material and localized releases from above and underground fuel storage tanks, historic shipbuilding or industrial activities.

In deep soil, TPH exceeding ESLs is limited to Parcel 9 and the DNAPL impacted area on Parcel 8 (Figures 11 and 22). The deep soil TPH contamination in Parcel 8 is likely associated with the migration of DNAPL from the former manufactured gas plant located south of Parcel 8. The deep soil contamination on Parcel 9 is likely associated with AST/UST releases and historic shipbuilding activities.

6.1.2 PAHs

The PAH ESL exceedances are ubiquitous and laterally discontinuous in shallow soil (Figure 20), and are likely associated with contaminants present in Bay fill material. In deep soil, PAHs exceeding ESLs are limited to Parcel 9 and the DNAPL area in Parcel 8 (Figures 11 and 23). The deep soil PAH contamination in Parcel 8 is likely associated with the migration of DNAPL from the former manufactured gas plant. The deep soil PAH contamination on Parcel 9 is likely associated with AST/UST releases from historic shipbuilding activities, and asphalt in fill material.

6.1.3 Metals

In shallow soil, metals including arsenic, cadmium, chromium, copper, lead, mercury, vanadium, and zinc are present throughout the Site at concentrations exceeding ESLs (Figure 21). Certain metals (arsenic, cadmium, copper, chromium, nickel, vanadium, and zinc) are components of serpentine bedrock present beneath the Site and in the fill material. The majority of the metals concentrations exceeding ESLs are within the background concentration ranges for soil and serpentinite rock (Table 9). However, some detections of the following metals were present above ESLs and these background concentration ranges as indicated:

- Parcel 1 – zinc
- Parcel 2 – arsenic, cadmium, lead, copper and zinc
- Parcel 4 – arsenic copper zinc
- Parcel 6 – arsenic copper, mercury and zinc
- Parcel 8- arsenic, copper, lead, and zinc
- Parcel 9 – arsenic copper lead and nickel and zinc
- Central Plaza Park – arsenic, lead, mercury, and zinc
- Crane Cove Park – arsenic, copper, and zinc
- Slipways Park – arsenic, copper, and zinc

Elevated metal concentrations in shallow soil may be associated with historic shipbuilding and industrial activities such as plating welding or metal fabrication.

Metal ESL exceedances in deep soil are limited (Figure 24) and are likely associated with Bay fill material and serpentine bedrock. In deep soil some detections of the following metals were present above ESLs and these background concentration ranges as indicated:

- Parcel 2 – arsenic
- Parcel 6 – arsenic
- Parcel 8 – cadmium
- Slipways Park – arsenic, copper, and vanadium

6.1.4 Asbestos

Asbestos was present in some soil samples at low levels (between <1% and 2%). Concentrations of NOA in soil at the Site are related to the native serpentine rock in the fill material rather than to contamination from hazardous materials formerly used at the Site.

6.1.5 Hazardous Waste

In shallow soil at 0 to 10 feet bgs, metals are present at levels above California Hazardous Waste criteria in areas indicated on Figure 29. Approximately 23% of the total number of soil boring locations would be classified as non-RCRA, California-regulated hazardous waste due to total or soluble metals concentrations. No shallow soil sample results exceeded the TCLP federal Hazardous Waste Criterion. None of the soil samples greater than 10 feet bgs would be characterized as state or federally-regulated hazardous waste. A summary of the hazardous waste criteria results are presented in Table 16.

6.2 Groundwater

6.2.2 TPH

TPH was reported above ESLs in grab groundwater samples collected from Crane Cove Park, Parcel 9, Parcel 4, and Central Plaza Park, and are likely associated with the presence of TPH in fill material and historic industrial operations. Heavily degraded petroleum hydrocarbons were present in soil borings at Parcel 9, and at Parcel 4 near the former UST/AST fuel storage area east of Building 113. TPH was not reported above ESLs in any of the monitoring wells with the exception of TMW-28A in Slipways Park where TPH exceedances are likely associated with the migration of MGP contaminants from the Potrero Power Plant site located south of Parcel 8 (Figure 11).

6.2.3 PAHs

PAH exceedances were reported in grab groundwater samples collected from Crane Cove Park, Parcel 9, Parcel 2, Parcel 4 and Central Plaza Park. The PAH exceedances in grab groundwater samples are likely associated with the leaching of PAHs from fill material, localized releases from above and underground fuel storage tanks, historic shipbuilding or industrial activities, and the presence of NAPL in soil borings at Parcel 9. Dissolved PAH in monitoring wells exceeded ESLs at only two locations, one at Crane Cove Park (CCMW-01) and one at Slipways Park (TMW-28A). Dissolved PAH exceedances at these locations are likely associated with leaching of PAH contaminated fill material at former slipways, and the migration of MGP waste from the Potrero Power Plan site located south of Slipways Park.

6.2.4 Metals

In groundwater samples, concentrations of dissolved metals exceeded ESLs throughout the Site with the exception of Parcels 4 and 7. The metal exceedances in groundwater samples are likely associated with the leaching of metals from Bay fill material and with historic industrial activities such as plating and welding and metal fabrication. The arsenic exceedance in Central Plaza Park may be related to low dissolved oxygen concentrations creating reducing conditions and mobilizing arsenic.

6.3 NAPL

A mixture of degraded petroleum fuel hydrocarbons is present as NAPL in soil, and as discontinuous globules in groundwater within a portion of Parcel 9. The lateral extent of potential NAPL appears to be approximately 350 feet wide and 800 feet long (Figure 30). During the field investigation, visible hydrocarbon staining was observed in soil in P9SB-01, P9SB-02, P9SB-03, P9SB-05, P9SB-07, P9SB-08, P9SB-09A, P9SB-09B/P9MW-03, P9SB-12, and P9SB-13, (Figure 11). Visible heavily degraded NAPL was observed in groundwater samples from P9SB-04/P9MW-02, P9SB-06/P9MW-01, P9SB-07, P9SB-09A, P9SB-10, and P9SB-11.

The vertical extent of NAPL in soil appears to extend from the shallowest depth at which it was encountered, six feet bgs in boring P9SB06, to a maximum of nine feet in boring P9SB-04/P9MW-02. NAPL was typically observed as globules near the top of groundwater in borings P9SB-04/P9MW02, P9SB-09A, P9SB-06/P9MW-01, P9SB-07, and P9SB-11. NAPL was also observed during the installation and well development activities of monitoring wells P9MW-01 and P9MW-02. However, NAPL was not observed during purging and groundwater sampling activities. This degraded oily material is not present in sufficient quantity to form a separate phase, or continuous layer floating on the groundwater.

As discussed in Section 5.2.6 the physical property parameters indicate that the NAPL is highly immobile and will not migrate into the Bay. Sampling results from monitoring wells installed at the Bay margin indicate that NAPL has not migrated to the shoreline.

6.4 Soil Gas

Soil gas impacts at the Site are minimal with the following two exceptions. At Parcel 2, benzene exceeds the ESL at one location north of Building 36. The source of benzene at this location is uncertain and benzene was not detected at elevated concentrations in groundwater. At Parcel 8, napthalene exceeds the ESL at one location. The source of the naphthalene may be PAHs in the fill material related to the former coal gasification plant south of Parcel 8.

Methane was not present at the Site at concentrations exceeding Title 27 or explosive limits. The maximum methane concentration detected at the Site is 1,200 µg/L at semi-permanent vapor probe P6SGP-01. This maximum methane level detected at 0.183 % is well below the 1.25% for protection of indoor air quality in overlying structures, and well below the 5% LEL limits in Title 27.

7.0 HUMAN HEALTH RISK ASSESSMENT

This human health risk assessment (HHRA) has been prepared for the Pier 70 Site (Figure 2) to evaluate potential human exposures and health risks associated with future Site use conditions at Pier 70, and identify areas within the Pier 70 property that may require mitigation in support of decision-making during future construction and property development. The risk assessment findings suggest that under current conditions, Site occupants or visitors are not exposed to chemical concentrations resulting in unacceptable cancer risk or noncancer hazard based on regulatory target ranges. The risk assessment findings do not indicate the need for soil or groundwater remedial actions that would adversely impact the feasibility of future development as envisioned in the Master Plan. Supporting information, tables, and figures associated with this HHRA are provided in Appendix L.

The methodology used to perform the HHRA is consistent with Water Board, California Environmental Protection Agency (Cal/EPA) and USEPA risk assessment guidance which are listed in the Reference section and referenced below.

The following HHRA sections represent the various components required for performing the HHRA in accordance with regulatory guidance.

- **Section 7.2: Hazard Identification** - Identifies the chemicals that have been evaluated in this HHRA.

- **Section 7.3: Exposure Assessment** - Discusses the human populations that may potentially be exposed to chemicals in soil, soil gas, or groundwater and the pathways through which the exposures may occur and presents the exposure assumptions.
- **Section 7.4: Fate and Transport Modeling** - Presents the fate and transport modeling used to predict the concentration of volatile chemicals and particulates in air.
- **Section 7.6: Risk Characterization** – Explains the methodology for the calculation of cancer risk and noncancer hazards and presents the estimated potential excess lifetime cancer risk and chronic noncancer effects on a parcel-by-parcel basis for the Site.
- **Section 7.7: Risk Characterization Results –** Presents a discussion of the HHRA results for each parcel based on future land use and receptor-specific cancer risks and noncancer hazards.

7.1 Scope of the Risk Assessment

A four-step process was used to conduct the HHRA, consistent with USEPA and CalEPA Department of Toxic Substances Control (DTSC) guidance:

Hazard Identification. This step included identification and tabulation of applicable environmental data for use in the subsequent steps of the HHRA process. The data were examined for data quality as appropriate for use in a quantitative risk assessment. The data set evaluated in the HHRA consisted of soil (from 1989 through 2010), soil gas (from 2009 through 2010), and groundwater (from 1989 through 2010) data collected by various consultants, as discussed in Section 2.2 and summarized in Table 2. Most locations that had been previously sampled between 1989 and 2003 were not re-sampled during recent sampling events. All data collected between 1989 and 2010 that met data quality standards were included for evaluation in the HHRA.

Exposure Assessment. The nature and quantitative estimate of the magnitude of potential exposures to the selected chemicals of potential concern (COPCs) were evaluated as part of the exposure assessment. The exposure assessment consisted of describing the anticipated future land use and exposure setting, identifying potential exposure scenarios and potentially complete exposure pathways, identifying potential exposure points, estimating exposure point concentrations (EPCs), and calculating estimates of chemical intakes.

Toxicity Assessment. This step consisted of identifying and compiling toxicity criteria (e.g., noncancer chronic reference doses and cancer slope factors) for the COPCs at the Site. In the absence of toxicity criteria for a COPC, the chemical was evaluated using toxicity criteria for a surrogate chemical with similar chemical and physical properties.

Risk Characterization. The results of the exposure analysis were then combined with toxicity criteria to estimate risk. The significance of potential adverse health outcomes was expressed as a Hazard Index representing a numerical ratio of the intake to a reference criterion for non-carcinogens, and as a probability statement in terms of incremental risk cancer outcomes for carcinogens.

7.2 Hazard Identification

The hazard identification identifies those COPCs that will be quantitatively assessed in this HHRA. This selection of chemicals evaluated in the HHRA is based upon the analytical results from the investigations discussed in Section 2.0 of this report. The data used to complete the calculations in this HHRA are provided in Attachment L.1 provided on CD in Appendix L. As described in the Work Plan (T&R 2009), a chemical was included in this HHRA if it was detected once in soil, soil gas, or groundwater. The list of chemicals evaluated in this HHRA is summarized in Table L-1.

7.3 Exposure Assessment

In evaluating the potential human health risks posed by a Site, it is necessary to identify the populations that may potentially be exposed to the chemicals present, and to determine the pathways by which these exposures may occur. Identification of the potentially exposed populations requires evaluating the human activity and anticipated land-use at the Site.

Once the potentially exposed populations are identified, the complete exposure pathways by which individuals in each of these potentially exposed populations may contact chemicals present in the soil gas, groundwater, and soil at the Site are determined. An exposure pathway is defined as "the course a chemical or pollutant takes from a source to an exposed organism" (USEPA, 1989a). An exposure route is "the way a chemical or physical agent comes in contact with an organism (e.g., by inhalation, ingestion, dermal contact) enters" (USEPA, 1989a). A complete exposure pathway requires the following four key elements:

- Chemical source
- Migration route (i.e., environmental transport)
- An exposure point for contact (e.g., soil, air, or water)
- Human exposure route (e.g., inhalation)

An exposure pathway is not complete unless all four elements are present.

A conceptual site model (CSM) for potential exposure pathways is used to show the relationship between a chemical source, exposure pathway, and potential receptor at a site. The CSM identifies all potential or suspected chemical sources, potentially impacted media, and potential receptors. It also identifies the potential human exposure routes for contacting impacted media. These source-pathway-receptor relationships provide the basis for the quantitative exposure assessment. In fact, only those complete source-pathway-receptor relationships are included in the quantitative risk evaluation. The risk assessment CSM for the Site is shown on Figure 31.

7.3.1 Potentially Exposed Populations

Planned future land use for the Site includes high density residential, commercial/industrial, cultural/institutional, retail and recreational. As previously discussed, the Site is divided into nine parcels and three recreational parks. The planned future uses for the Site are shown on the Master Plan (Figure 5) as follows:

- **Parcels 1 and 3:** Both parcels will be largely occupied by new buildings, with the historical Twigg/Kneass Building remaining on Parcel 1. Parcels 1 and 3 both face Illinois Street, and both could potentially have high density residential use after redevelopment.
- **Parcels 2 and 4:** The historical structures will be refurbished and may include uses such as a "Powerhouse Museum", retail businesses, restaurants, and other commercial or institutional uses.
- **Parcels 5, 6, 7 and 8:** Parcel 5 is anticipated to be occupied by two historical structures, which were associated with shipyard activities. Parcels 6 and 7 each contain one or more structures, which will be demolished and removed. Parcels 6 and 8 are underlain by four historical slipways, which have been completely filled in and paved over. Future Site uses at

these parcels are anticipated to be commercial or light industrial, such as a "tech campus", consisting largely of new, multi-story buildings.

- **Parcel 9:** This parcel will remain leased to the BAE Systems San Francisco Ship Repair (BAE) and continue to operate as a ship repair and dry dock facility.
- **Crane Cove, Slipways, and Central Plaza Parks:** Future use in all of these areas is planned to be open space.

Based on these planned future uses, potentially exposed populations include residents (adults and children), commercial workers (inclusive of retail, commercial, and industrial uses), recreational park users (adults and children), and construction workers.

DNAPL from the adjacent Potrero power plant has impacted soil and groundwater in Parcel 8 and Slipways Park with PAHs, BTEX, petroleum hydrocarbons, and metals (Section 2.1 and Figure L-5). The highest concentrations of these COPCs are found in the eastern half of Parcel 8 and the southern portion of Slipways Park, and are qualitatively and quantitatively different from the nature and extent of contamination present throughout the rest of these parcels. Consequently, a separate exposure area was designated and referred to as the "former MGP subsurface investigation area (MGP Investigation Area)". Based on anticipated uses for Parcel 8 and Slipways Park, potentially exposed populations evaluated for the MGP Investigation Area were commercial workers, recreational park users, and construction workers.

7.3.2 Relevant Exposure Pathways

7.3.2.1 Soil

All potentially exposed populations considered in this HHRA could be exposed directly to chemicals in soil. Potential routes of exposure for surface soils would include incidental ingestion, dermal contact, and inhalation of windblown particulates. The outdoor residential and commercial workers are assumed to be exposed to shallow soil from 0 to 2 feet bgs. Residential exposure to deeper soil (0 to 10 feet bgs) was not evaluated because high density residential housing is planned and residents are not expected to participate in activities that would expose them to soil deeper than 2 feet bgs, such as planting trees or installing a swimming pool. Evaluation of construction workers' exposure assumed that they would be exposed to soil from 0-10 ft bgs during construction activities such as trenching, pile-driving, and excavation.

7.3.2.2 Soil Gas

Inhalation of VOCs in ambient air was modeled for the construction worker and recreational user populations because they are assumed to be outdoors. Commercial workers and residents could potentially be exposed to compounds migrating from soil gas into indoor air via the inhalation pathway. Details for estimating exposures from the soil gas pathway are provided in Section 7.4.1.3.

7.3.2.3 Groundwater

Depth to groundwater is influenced by tidal fluctuations to varying degrees in different portions of the Site, as discussed in Section 5.1.3.4. In October 2009, groundwater was encountered at depths ranging between approximately 5 and 13 feet bgs (Table 6). During the wet season, in March 2010, groundwater was encountered at depths ranging between approximately 3 and 13 feet bgs (Table 6).

Construction workers conducting subsurface activities (e.g., trenching, driving piles, excavating) may come into contact with groundwater that infiltrates the excavation. Therefore, dermal contact with groundwater was considered a complete exposure pathway for construction workers. Commercial workers, recreational users, and residents are not anticipated to come into direct, dermal contact with groundwater at these depths. Thus, the direct contact with groundwater is not considered a complete exposure pathway and was not evaluated in this HHRA for these receptors.

There are no known drinking water wells or private supply wells in the vicinity of the Site. Drinking water supplied to the City of San Francisco is primarily from high Sierra snowmelt collected in the Hetch Hetchy Reservoir (San Francisco Public Utilities Commission [SFPUC], 2010). Site groundwater is not considered a source of drinking water as discussed in Section 3. Based on these Site characteristics, ingestion of groundwater is not considered a complete exposure pathway and was not evaluated in this HHRA, except for incidental ingestion by the construction worker during contact with groundwater from infiltration.

For Site-wide groundwater, a potentially complete exposure route would be exposure to VOCs via the inhalation of chemicals that have migrated from groundwater through the soil column into indoor or ambient (outdoor) air. Therefore, potential exposures resulting from the inhalation of vapors that have migrated from groundwater through the soil column were quantified in this HHRA for all potentially exposed populations. For construction workers and recreational users, inhalation exposures to VOCs that have migrated from groundwater into ambient air were evaluated. The methodology for estimating ambient exposure from VOCs in soil gas is described in Section 7.4.1.3. For commercial workers and residents, only the inhalation of VOCs in indoor air was modeled since outdoor concentrations of VOCs will be lower than indoor air concentrations due to mixing with ambient air.

7.3.3 Estimation of Intake

The purpose of this section is to develop an upper-bound estimate of the theoretical intake for each of the potentially exposed human populations via each of the exposure routes shown on Figure 31. Estimates of human intake are a function of exposure parameters such as duration, frequency, and contact rates. This section provides the equations and assumptions used to develop the intake factors used in the calculation of the risk.

The USEPA (1989a) defines exposure as "the contact with a chemical or physical agent", and defines the magnitude of exposure as "the amount of an agent available at [human] exchange boundaries (i.e., lungs, gut, skin) during a specified time period." Exposure assessments are designed to determine the degree of contact a person has with a chemical. This section presents the equations used to estimate chemical exposures or intakes. These estimates of intake are combined with toxicity values (Section 7.5) to estimate risk for each population of concern (Section 7.6.2).

The approaches adopted by the Water Board in the derivation of ESLs (RWQCB, 2008) and the Office of Environmental Health Hazards Assessment (OEHHA) in establishing the California Human Health Screening Levels (CHHSLs, Cal/EPA, 2005b) and the USEPA's *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation of Risk Assessment)* were used ("RAGS F", USEPA, 2009) were used to estimate intakes in this assessment. The generalized equations used in this assessment are presented below.

The following intake equation was used to estimate exposures via inhalation of vapors migrating into indoor air from soil gas or groundwater and inhalation of soil particulates:

$$IF = \frac{TF \times ET \times EF \times ED}{CF \times AT}$$

Where:

IF = Intake Factor ([micrograms (ug)/liter (L)]/[ug/L] for soil gas or [milligrams (mg)/m^3]/[mg/L] for groundwater)
TF = Transfer Factor, (e.g., (ug/ L)/(ug/L) for soil gas or (mg/m^3)/(mg/L) for ground water) ET = Exposure Time (hours/day)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
CF = Conversion Factor (day/24 hours)
AT = Averaging Time; period over which exposure is averaged (days)

The following intake equation was used to estimate exposures via inhalation of soil particulates:

$$IF = \frac{ET \times EF \times ED}{PEF \times CF \times AT}$$

Where:

IF = Intake Factor ([mg/m^3]/milligram per kilogram [mg/kg] for soil particulates)
PEF = Particulate emission factor, ([mg/kg]/[mg/m^3] for soil particulates)
ET = Exposure Time (hours/day)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
CF = Conversion Factor (day/24 hours)
AT = Averaging Time; period over which exposure is averaged (days)

For estimation of intake direct contact with soil and groundwater, the following generalized equation was used:

$$IF = \frac{CR \times TF \times ET \times EF \times ED}{BW \times AT}$$

Where:

IF = Intake Factor ([e.g., kg soil/kg body weight-day)
CR = Contact Rate; the amount of medium contacted per unit time (e.g., mg soil/day, L water/ kg bodyweight-day)
TF = Transfer Factor, (e.g., (mg/m^3) chemical in air /(mg/L))
ET = Exposure Time (hours/day)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time; period over which exposure is averaged (days)

Tables L-2 through L-7 present the route-specific equations used in this HHRA. The equations for inhalation of vapors from soil gas and groundwater in Table L-2, inhalation of windblown soil particulates in Table L-3, incidental ingestion of soil in Table L-4, dermal contact with soil in Table L-5, incidental ingestion of groundwater are presented in Table L-6, and dermal contact with groundwater in Table L-7.

7.3.4 Exposure Assumptions

Assumptions for route-specific exposure parameters used to estimate intakes at the Site could be separated into the following three categories:

- Assumptions regarding human physiology (e.g., body weight)
- Assumptions specific to the potentially exposed population (e.g., years in which an individual resides at the same location)
- Assumptions specific to the given route of exposure (e.g., amount of soil ingested each day).

In general, exposure assumptions corresponding to a reasonable maximum exposure (RME) scenario were used. Intake assumptions for the RME scenario represent "the highest exposure that is reasonably expected to occur at the site" (USEPA, 1989a). According to the USEPA, the intent of the RME scenario is "to estimate a conservative exposure case (i.e., well above the average case) that is still within the range of possible exposures" (USEPA, 1989a). The RME is estimated using "many conservative and upper-bound parameter values and assumptions" (USEPA, 1989a).

Exposure assumptions used to estimate intake factors for the potential populations of concern are summarized in Section 7.3.1. The exposure assumptions used in this HHRA are presented in Table L-8. Additionally, in order to calculate the total intake from dermal contact with soil, a chemical specific absorption factor (ABS) must be incorporated into the intake calculation. The ABS represents the fraction of a chemical that will absorb across the skin and into the blood stream and is expressed as a unitless proportion. ABS values were selected based on the USEPA *Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual. Part E, Supplemental Guidance for Dermal Risk Assessment* (USEPA, 2004a). A chemical is defined as volatile for the purposes of assigning dermal absorption factors, if its molecular weight is below 200 gram per mole and the Henry's is constant greater than 10^{-5}

atmosphere-cubic meter per mole (atm-m^3/mol), except for polycyclic aromatic hydrocarbons; compounds meeting these criteria were assigned an ABS value of zero (USEPA, 2004a). Consistent with USEPA (2004), an ABS value of 0.1 was used for semi-volatile organic compounds not assigned a chemical-specific value. For PAHs, pesticides, PCBs, and metals, the recommended ABS values were used. For metals, if a chemical-specific value was not provided by either Cal/EPA (2005) or USEPA (2004), then a value of zero was used; this approach is consistent with the recommended USEPA approach that states:

> *"There are no default dermal absorption values presented for volatile organic compounds. The rationale for this is that in the considered soil exposure scenarios, volatile organic compounds would tend to be volatilized from the soil on skin and should be accounted for via inhalation routes in the combined exposure pathway analysis. For inorganics, the speciation of the compound is critical to the dermal absorption and there are too little data to extrapolate a reasonable default value."*

The ABS values used in this HHRA are presented in Table L-9.

For dermal contact with groundwater and surface water, the dermal permeability coefficient (Kp) must be incorporated into the intake equation. The Kp is defined as the rate at which a chemical passes from the water and across the skin. The chemical specific Kp values are displayed in Table L-10.

7.3.5 Quantification of Exposure

The intake factors are presented in Table L-11 for both carcinogenic and non-carcinogenic effects. The chemical-specific transfer factors are discussed in Section 7.4 below.

7.4 Fate and Transport Modeling

7.4.1 Modeling of Vapor Migration

This section describes the general approach used to estimate intermedia transfer factors needed to evaluate potential exposure through the inhalation route. Chemicals detected in soil gas or groundwater can potentially migrate in a vapor phase through the unsaturated zone to indoor or ambient air. This migration will be quantified for the purposes of this HHRA through an intermedia transfer factor. This transfer factor is defined so that when it is multiplied by the source concentration of a chemical in soil gas or groundwater in (μg/L), the product is the resulting average concentration that is predicted in indoor or ambient air (in μg/L). This HHRA used transfer factors for soil gas to indoor air in residential and commercial buildings, and volatile constituents from groundwater to indoor air in residential and commercial buildings.

Intermedia transfer factors were estimated using the advanced version of the screening-level model of vapor migration described by Johnson and Ettinger (1991). Specifically, Version 3.1 of the model developed by the USEPA (2004a) was used. The equations used in the spreadsheet are described in USEPA (2004a).

The Johnson and Ettinger model and its variants couple the following fate and transport processes:

- Source zone partitioning from groundwater to soil gas to determine source vapor concentration (groundwater only)
- Transport across the vadose zone by diffusion
- Transport by diffusion and advection across the soil surface and, if present, a surface barrier such as asphalt or building foundation
- Dispersion in indoor air assuming uniform mixing in the building.

For groundwater transfer factors, the first process in the above list, source zone partitioning, determines the vapor concentration of the chemical at the source, which in this case is the depth at which groundwater is encountered. For soil gas transfer factors, no source zone partitioning is necessary. The last three processes contribute to the attenuation of the source soil vapor concentration as it migrates to indoor air. In the context of the Johnson and Ettinger model, the combined effect of these three attenuation processes is typically referred to as alpha (ɑ), the soil vapor attenuation coefficient. Intermedia transfer factors, as used in this HHRA, include the effect of source zone partitioning as well as the three attenuation processes. Therefore, the groundwater transfer factor is simply the product of the appropriate partition coefficient and the vapor attenuation coefficient.

The calculation of transfer factors is based on parameters describing the properties of the VOCs, the vadose zone, the surface barrier, and the air dispersion zone. The physical-chemical properties for VOCs are shown in Table L-12. Based on guidance from USEPA (2004a), only chemicals that easily volatilize are included in the evaluation of indoor air. These include chemicals with a Henry's Law constant of greater than 1 x 10^{-5} atmosphere-cubic meter per mole (atm-m^3/mol) and a molecular weight of less than 200 grams/mole (g/mol) (USEPA, 2004b; Yaws and Yang, 1992) along with any chemicals detected in soil gas.

For the soil vapor migration calculations it was assumed that the soil consisted of two layers of construction fill which overlays the Site soil. The top 10 centimeters (cm) of the fill consists of gravel and the bottom 30 cm consists of an engineered fill consisting of compacted silty clay. The soil type at the Site from the base of the construction fill to soil gas sampling depth was conservatively assumed to be sand. Default values were used for some parameters (e.g., bulk density, porosity, and water content) based on the soil type. All transfer factors were calculated using the chemical and vadose zone parameters given in the aforementioned tables. Although the soil parameters remain the same, calculation of transfer factors for each receptor population is based on different assumptions regarding air dispersion zone dimensions and mixing rates.

7.4.1.1 Migration from Soil Gas to Indoor Air

The soil gas sampling depth ranged from 2 to 10 feet, with typical sampling depths at 4 to 5 feet bgs. To be conservative, the minimum soil gas sampling depth (2 feet) was used as the 'depth to source' in the Johnson and Ettinger model to ensure that risks would not be underestimated at locations that were sampled at depths shallower than typical sampling depths of 4 to 5 feet bgs.

The different assumptions for each receptor population are described in the following sections.

Residential Receptor

The additional parameters needed to estimate migration and mixing of residential indoor air are related to the foundation and dimensions of the high density residential building. Transfer factors were derived assuming a slab-on-grade building. The building length and width are set to the defaults recommended by USEPA (2004a). All parameter values for indoor air modeling are shown in Table L-13. The air exchange rate chosen is the residential default value of 0.5 air changes per hour (Cal/EPA, 2005a). This is equivalent to the 50th percentile of values measured in US residences among the studies summarized in

USEPA's Vapor Intrusion Guidance (USEPA, 2004b). The transfer factors for soil gas to indoor air for the residential receptor are shown in Table L-14 for each area.

Commercial Receptor

The receptor population for this exposure scenario is a commercial worker inside a one-story concrete slab-on-grade store, office, or similar commercial use. The parameters used for this scenario are the same as for the residential scenario, except for the following: the air exchange rate chosen is commercial recommended value of one (1) air changes per hour (Cal/EPA, 2005a), and the mixing height was assumed to be 10 feet. All parameter values for the commercial indoor air scenario are shown in Table L-13. The transfer factors for soil gas to commercial indoor air are shown in Table L-14 for each area.

7.4.1.2 Migration from Groundwater to Indoor Air

The depth to groundwater at the Site ranges from approximately five to 13 feet bgs across the Site (T&R, 2009). Near the shoreline, the depth to groundwater is three to five feet bgs. The depth to groundwater was assumed to be 10 feet bgs, as an average, for calculation of migration of VOCs from groundwater to indoor air. Using a depth shallower than 10 feet in the vapor intrusion modeling will not result in a large difference (less than a factor of two, and typically only about a 20%-50% increase) in vapor migration through the subsurface to indoor air because the soil type selected for modeling was conservative. Therefore, the addition of a few feet of sandy soils is not expected to be an effective barrier against diffusion. The vapor intrusion calculations are intended to represent conditions for an average depth to groundwater over many years; consequently, a depth of 10 feet bgs was selected to be representative of average site conditions. The different assumptions for each receptor population are described in the following sections.

Residential Receptor

The same parameters to estimate migration and mixing of residential indoor air were used as described in Section 7.4.1.1. The transfer factors for groundwater to indoor air for the residential receptor are shown in Table L-15 for each area.

Commercial Receptor

The same parameters to estimate migration and mixing of commercial indoor air were used as described in Section 7.4.1.1. All parameter values for the commercial indoor air scenario are shown in Table L-13. The transfer factors for groundwater to commercial indoor air are shown in Table L-15 for each area.

7.4.1.3 Modeling of Vapor Migration From Soil Gas or Groundwater to Outdoor Air

Intermedia transfer factors for transport to ambient and trench air from soil gas and groundwater were calculated by combining a vadose zone diffusion model and an air dispersion model. For a soil gas source, the transport of chemicals through the vadose zone is modeled assuming steady-state diffusion of vapor, similar to that recommended in the USEPA (1995) *Guideline for Predictive Baseline Emissions Estimation for Superfund Sites*. This model assumes an infinite source of chemicals is present at some depth below a layer of clean soil that extends from the source to the soil surface. For a groundwater source, this is preceded by source zone partitioning, which determines the vapor concentration of the chemical at the source, which in this case is the depth at which groundwater is encountered.

For both soil gas and groundwater sources, the dispersion of chemicals in ambient air is calculated using air dispersion factors (Q/C) according to the USEPA (2002). The dispersion factors are selected based on the climatic zone in which the Site is located and a site-specific chemical source area. USEPA developed the dispersion factors based on the results of more complex air dispersion modeling with the ISC3 model using detailed meteorological input data

7.4.1.4 Migration from Soil Gas to Outdoor Air

The soil type at the Site from the surface to the soil gas sampling depth was conservatively assumed to be sand because the upper 10 to 25 feet is fill material consisting of crushed serpentine bedrock, sandy clays, clayey sands, clayey and sandy gravels, brick, concrete, and wood construction debris as described in Section 5. Below the fill material, clay is underlain by sand, but the depth to groundwater and soil gas sampling depths are so shallow that diffusion is assumed to occur only through the fill layer. Default values were used for some parameters (e.g., bulk density, porosity, and water content) based on the soil type. All transfer factors were calculated using the chemical and vadose zone parameters given in the aforementioned tables.

The different assumptions for each receptor population are described in the following sections.

Recreational Receptor

The soil gas sampling depth ranged from 2 to 10 feet, with typical sampling depths at 4 to 5 feet. To be conservative, the minimum soil gas sampling depth (2 feet) was used as the assumed 'depth to source' for all parcels. All parameter values for the recreational outdoor air scenario are shown in Table L-13. The transfer factors for soil gas to outdoor air for the recreational receptor are shown in Table L-14.

Construction Worker Receptor

As the construction worker is assumed to be in a trench, the soil gas sampling depth was assumed to be 10 cm below the base of the trench. All parameter values for the construction worker outdoor air scenario are shown in Table L-13. The transfer factors for soil gas to outdoor air for the construction worker are shown in Table L-14.

7.4.1.5 Migration from Groundwater to Outdoor Air

The soil type at the Site from the surface to the soil gas sampling depth was conservatively assumed to be sand. Default values were used for some parameters (e.g., bulk density, porosity, and water content) based on the soil type. All transfer factors were calculated using the chemical and vadose zone parameters given in the aforementioned tables.

The different assumptions for each receptor population are described in the following sections.

Recreational Receptor

The depth to groundwater at the Site ranges from approximately eight to 12 feet across the Site (T&R, 2009). The depth to groundwater was approximated at 10 feet (as an average depth across the Site) for groundwater to outdoor air pathways. All parameter values for the recreational outdoor air scenario are shown in Table L-13. The transfer factors for groundwater to outdoor air for the recreational receptor are shown in Table L-15.

Construction Worker Receptor

Two construction worker scenarios were considered: a construction worker in a shallow, dry trench and a construction worker in a deep, wet trench. The depth to groundwater at the Site ranges from approximately eight to 12 feet across the Site (T&R, 2009). In the shallow trench scenario, the trench is assumed to be 4 feet deep, thus the depth to groundwater was assumed to be 6 feet below the base of the trench. In the deep trench scenario, the trench is assumed to be 9 feet deep, thus the depth to groundwater was assumed to be 1 foot below the trench. All parameter values for the construction worker outdoor air scenario are shown in Table L-13. The transfer factors for groundwater to outdoor air for the construction worker are shown in Table L-15.

7.5 Toxicity Assessment

The toxicity assessment examines the potential for a chemical to cause adverse health effects in exposed individuals. It also presents the relationship between the magnitude of exposure and potential for adverse effects. Toxicity values used to estimate the likelihood of adverse effects occurring in humans at different exposure levels are identified as part of the dose-response task within the risk assessment process.

The hierarchy of sources for the toxicity criteria used in this assessment is consistent with those recommended by the Cal/EPA and USEPA for risk assessments as follows:

- Cal/EPA OEHHA Toxicity Criteria Database (Cal/EPA, 2010). The Toxicity Criteria Database is an online database that contains Cal/EPA-approved oral and inhalation toxicity values.
- USEPA's Integrated Risk Information System (IRIS) (USEPA, 2010a). IRIS is an on-line database that contains USEPA-approved oral and inhalation toxicity values.
- USEPA's Provisional Peer Reviewed Toxicity Values (PPRTVs) (USEPA, 2010b). PPRTVs are interim toxicity values developed by the Office of Research and Development/National Center for Environmental Assessment/Superfund Health Risk Technical Support Center (as cited in USEPA, 2010c)
- The Agency for Toxic Substances and Disease Registry (ATSDR, 2009) minimal risk levels (MRLs)
- USEPA's *Health Effects Assessment Summary Tables* (HEAST) (USEPA 1997b). HEAST provides an older listing of provisional toxicity values.

Table L-16 presents the unit risk factors (URFs), cancer slope factors (CSFs), reference concentrations (RfCs) and reference doses (RfDs) used in this HHRA. Where available, the table also presents the classification of carcinogens according to the weight-of-evidence. Specific dermal route CSFs and RfDs have not yet been developed for any chemicals. Consistent with Cal/EPA and USEPA guidance, potential health effects associated with dermal exposure are calculated using the oral toxicity factors.

In the absence of chemical specific criteria from the above sources, other regulatory or scientific sources are utilized. The toxicity criteria selected for TPH mixtures and inorganic lead, thallium, and dioxins and furans are discussed in further detail below.

7.5.1 Total Petroleum Hydrocarbons

The TPH constituents detectad at the Site consist of petroleum hydrocarbons in the TPHg, TPHd, and TPHmo ranges. In general, petroleum hydrocarbons are comprised of four major groups: alkanes, alkenes, cycloalkanes, and aromatics. Except for several specifically identified aromatic compounds such as benzene and certain PAHs, the hydrocarbons typically found in petroleum products are considered to be noncarcinogenic. If present at all, the carcinogenic hydrocarbons typically comprise a very small fraction of the mass of most petroleum releases. From a human health-risk standpoint, the main chemicals of potential concern in TPH mixtures are the aromatics. These aromatics, such as benzene, toluene, ethylbenzene, and xylene (BTEX), have been individually characterized and included in this HHRA. However, these aromatic compounds represent a very small fraction of the hundreds of noncarcinogenic hydrocarbon constituents present in TPH-diesel, TPH-gas, and TPH-residual ranges.

To address this issue, the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) developed a practical approach to addressing the noncancer risks posed by petroleum products. The TPHCWG is comprised of industry, government, and academic scientists, working to develop a broad set of guidelines to be used by engineering and public health professionals in decisions on petroleum contaminated media. The approach is based on the segregation of petroleum mixtures into categories of hydrocarbons with similar boiling ranges. This assessment uses the TPHCWG approach (TPHCWG, 1997).

The basis for the TPHCWG methodology is the examination of a mixture as the product of several smaller subsets, which are defined by specific carbon ranges and are referred to as fractions. Within each fraction, toxicity criteria are conservatively selected to be representative of the mixture of compounds comprising that fraction. Separate RfDs were selected for the aliphatics (i.e., alkanes, alkenes, alkynes, and cycloalkanes) and the aromatics (i.e., polynuclear aromatics, diaromatics, and monoaromatics). This is based upon the TPHCWG assumption that within a given carbon range and structural class (i.e., aliphatic or aromatic), individual chemical components have similar toxic effects. The RfDs for these identified by the TPHCWG were used in this assessment and are presented in Table L-16.

As is apparent from the previous discussion, in order to use the surrogate approach to estimate the noncancer risk for each of the three TPH ranges, the fractional composition of the TPH analytical range in terms of both carbon range and structural form (i.e., aliphatic or aromatic) must be defined. The assumed composition of TPH-diesel, TPH-gasoline, and TPH-residual are presented in Table L-17.

7.5.2 Thallium

Currently, there is no RfD for thallium using the hierarchy of sources described in Section 7.5. An RfD was derived based on the no-observed-effect- level (NOEL) of 4.05E-02 mg/kg-day and incorporating an uncertainty factor of 3,000 used by OEHHA to derive the public health goal for thallium in drinking water (Cal/EPA, 1999, 2004).

7.5.3 Inorganic Lead

The traditional RfD approach to the evaluation of chemicals is not applied to inorganic lead because lead is typically evaluated using blood lead concentrations, rather than external dose (Cal/EPA, 2007). Blood lead concentration is an integrated measure of internal dose, reflecting total exposure from Site-related and background sources. The US EPA has determined that lead exposure can result in neurotoxic and developmental effects at very low concentrations. The primary receptors of concern are children, whose nervous systems are undergoing development and who also exhibit behavioral tendencies that increase their likelihood of exposure. These effects, which may occur at exposures so low that they may be considered to have no threshold, have been correlated to blood-lead concentrations. Because there appears to be no clear threshold for neurotoxic effects of lead in children, the USEPA has not developed noncarcinogenic "safe" exposure levels (e.g., RfDs) for lead (IRIS, USEPA, 2004c). Instead, a bio-uptake model, Leadspread (CAL/EPA, 2007) is used by DTSC that relates measured lead concentrations in the environmental media with an estimated blood-lead level.

The revised CHHSL of 80 mg/kg for lead in residential soils was selected as the screening value for inorganic lead and corresponds to the soil concentration that results in a blood lead level of 1- µg/dL in children at the 90th percentile (Cal/EPA, 2009a). For the occupational worker, the revised CHHSL of 320 mg/kg for lead was used as a screening value and results in a blood lead level of 1 µg/dL in the fetus of an adult worker exposed to lead in soil (Cal/EPA, 2009a). For the construction worker scenario, the Region IX Regional Screening Level (RSL) of 800 mg/kg was selected as a screening value (USEPA, 2010c). As a conservative screening approach, the revised residential CHHSL of 80 mg/kg for lead was used for the evaluation of recreational users visiting Crane Cove, Central Plaza, and Slipways Parks.

For conservativeness, in addition to using Leadspread to evaluate the non-carcinogenic effects of lead exposure to future residents at the Site, lead in soil was also evaluated for its carcinogenic effects via incidental ingestion, dermal contact, and inhalation of particulates.

7.5.4 Dioxins and Furans

Dioxins and furans were evaluated in this HHRA as 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) toxicity equivalents (TEQ) concentrations ("dioxin TEQ"). The term 'dioxin' refers to a group of structurally-related chemicals (including furans) which have a shared mechanism of toxicity but that are not equally toxic. To account for the differential toxicity of each dioxin (congener) or dioxin-like compound, the concentration is modified by applying a toxic equivalency factor (TEF) that relates a congener's toxicity to that of the most potent dioxin, 2,3,7,8-TCDD, which has a TEF of one. The dioxin TEQ concentrations presented in Table L-18 were calculated by applying the 2005 World Health Organization (WHO) TEF protocol (Van den Berg et al., 2006), which is currently recommended by Cal/EPA (2009b) for use in risk assessment. When dioxins or furan congeners were reported as "not detected" (ND), the value corresponding to the detection limit was used in estimating the EPC. Thus, use of the detection limit as a surrogate concentration for ND concentrations likely overestimates the dioxin TEQ concentrations.

7.6 Risk Characterization

Risk characterization is the process of quantifying the significance of residual chemicals in the environment in terms of its potential to cause adverse health effects. The quantitative estimates are expressed in terms of a probability statement for the potential theoretical incremental cancer risks and Hazard Index (HI) for the likelihood of adverse noncancer health effects.

The general methodology used for estimating risk for carcinogens and non-carcinogens are presented in Sections 7.6.1.

The National Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] § 300) is commonly cited as the basis for target risk and hazard levels. According to the NCP, lifetime incremental cancer risks posed by a site should not exceed one in a million (1×10^{-6}) to one hundred in a million (1×10^{-4}), and noncarcinogenic chemicals should not be present at levels expected to cause adverse health effects (i.e., HI greater than one). As a risk management policy, the Cal/EPA generally considers 1×10^{-6} to be a point of departure for purposes of making risk management decisions,..

7.6.1 Methodology Used to Calculate Cancer Risk and Hazard Indices

Excess lifetime cancer risks associated with exposure to COPCs classified by the USEPA as carcinogens are characterized as an estimate of the probability (risk) that an individual will develop cancer over a lifetime (USEPA 1989a). This estimated theoretical lifetime incremental risk is expressed as a unitless probability. For example, an incremental cancer risk of 1×10^{-5} indicates an individual has a one-in-one hundred thousand chance of developing cancer during a 70-year lifetime as a result of the assumed exposure conditions. The lifetime incremental risk of cancer resulting from exposure to the COPCs is estimated in three steps:

First, the equation below was used to estimate the incremental, chemical-specific cancer risk for the inhalation of vapors migrating into indoor air from soil gas or groundwaterand inhalation of particulates from soil. For the estimation of cancer risks associated with the inhalation of vapors migrating into indoor air from soil gas or groundwater and the inhalation of particulates from soil, the methods prescribed in USEPA's *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation of Risk Assessment)* were used ("RAGS F", USEPA, 2009).

$$\text{Chemical-specific Risk (unitless)} = \text{Intake Factor} \times \text{EPC} \times \text{URF}$$

The equation below was used to estimate the incremental, chemical-specific cancer risk for the direct contact with soil and groundwater pathways. For the estimation of cancer risks associated with the direct contact with soil and groundwater the methods prescribed in Cal/EPA's *Preliminary Endangerment Assessment Guidance Manual* were used ("PEA Guidance", Cal/EPA, 1994).

$$\text{Chemical-specific Risk (unitless)} = \text{Intake Factor} \times \text{EPC} \times \text{CPF}$$

In the second step, the incremental cancer risk associated with exposure to multiple carcinogens for a single exposure pathway are calculated by summing the individual chemical-specific incremental cancer risks as follows:

$$\text{Pathway-specific Cancer Risk (unitless)} = \Sigma(\text{Chemical-specific Cancer Risk [unitless]})$$

Third, any multiple pathway-specific risks are then summed to estimate the total excess lifetime cancer risk:

$$\text{Total Cancer Risk (unitless)} = \Sigma(\text{Pathway-specific Cancer Risk [unitless]})$$

For the resident receptor, the sum of the adult and child incremental cancer risks is used to represent the total residential lifetime incremental cancer risk. For all other receptors, the sum of the incremental cancer risks associated with the various exposure pathways comprises the total lifetime incremental cancer risk for the specific receptor.

Estimation of chronic noncancer HIs were also conducted in a three step process. First, the equation below was used to estimate the chemical-specific noncancer hazard quotients for the inhalation of vapors migrating into indoor air from soil gas or groundwater and inhalation of particulates from soil. For the estimation of noncancer risks associated with the inhalation of vapors migrating into indoor air from soil gas or groundwater and inhalation of particulates from soil, the methods prescribed in RAGS Part F (USEPA, 2009).

$$\text{Hazard Quotient (unitless)} = \text{Intake Factor} \times \text{EPC} / \text{RfC}$$

The equation below was used to estimate the chemical-specific noncancer hazard quotients for the direct contact with soil and groundwater. For the estimation of noncancer risks associated with the direct contact with soil and groundwater the methods prescribed in the PEA Guidance, (Cal/EPA 1994).

Hazard Quotient (unitless) = Intake Factor x EPC / RfD

In the second step, the HIs associated with exposure to multiple noncarcinogens for a single exposure pathway are calculated by summing the individual chemical-specific noncancer hazard as follows:

Pathway-specific HI (unitless) = Σ(Chemical-specific HQs [unitless])

Third, any multiple pathway-specific HIs are then summed to estimate the total HI:

Total HI (unitless) = Σ(Pathway-specific HI [unitless])

The total excess lifetime cancer risk and noncancer hazards were calculated by summing the cancer risks and noncancer hazard quotients from soil and the higher of the cancer risks and noncancer hazard from either soil gas or groundwater.

7.6.1.1 Calculation of Exposure Point Concentrations (EPC)

The Exposure Point Concentrations (EPCs) along with the basis for choosing the EPC for soil, soil gas, and groundwater are included in Attachment L.2 on CD in Appendix L. In addition, the detection frequency, the range of detected concentrations, the Kaplan-Meier means, and a potential upper confidence limit (UCL) for each chemical were also provided. ProUCL will only calculate UCLs for datasets with at least three detected values and more than five samples. For chemicals with less than four detects or less than five samples, the maximum sample concentration was used as the EPC.

Unfiltered and filtered groundwater samples were collected at the Site. It would be inappropriate to perform statistics on a dataset representing both unfiltered and filtered samples. However, no more than five unfiltered groundwater samples had been collected at all parcels, which was not enough data to perform statistics on only the unfiltered samples. As a conservative approach, the maximum of the unfiltered and filtered data was selected to estimate the EPC for this HHRA. Frequently, the maximum concentration of the unfiltered data set was identical to the overall maximum for that parcel.

7.6.1.2 UCL calculations

The 95% UCLs for each chemical were calculated using the ProUCL 4.00.04 software. ProUCL calculates 95% UCLs using a large number of alternative methods, including both parametric methods and nonparametric methods. Parametric methods are based on the assumption that the data are consistent with a standard statistical distribution, such as normal, log-normal, or gamma. Nonparametric methods do not require any assumptions about the distribution.

For chemicals with 4 or more results, the nonparametric bias corrected accelerated (BCA) bootstrap method was used. This nonparametric method is robust enough to handle any typical environmental dataset, including those that contain non-detects and is one of the methods that ProUCL selects as a potential UCL to use. The ProUCL input data and associated output files are also included as Attachment L.2 on CD in Appendix L.

7.6.1.3 Duplicate Samples

Prior to calculating the UCLs, any sets of duplicate samples were combined to represent one data point. First, for field duplicates, the maximum concentration of all samples collected at the same location on the same date and at the same depth was selected as the sample concentration. Second, to avoid biasing the EPCs based on frequency of sampling, if samples were collected at the same location on different dates, they were combined as a single data point for integration into the EPC calculations. Under the second case, if all samples included detections, the detected values were averaged. Similarly, if no samples included detections, the detection limits were averaged. If some samples were non-detect and other samples weren’t, the sample was assigned detected concentration equal to the average of only the detected values.

7.7 Risk Characterization Results

Summaries of cancer risks and noncancer hazard indices are presented in this section on a parcel-by-parcel basis for the receptors evaluated under the residential, commercial worker, recreational visitor, and construction worker exposure scenarios. The construction worker was evaluated for exposure to groundwater under two scenarios. The first scenario assumes direct contact (i.e., incidental ingestion of and dermal contact with groundwater) in a hypothetical trench and is termed the “wet trench” scenario. The second, assumes no direct contact with groundwater and is termed the “dry trench” scenario. As a conservative approach, the cancer risk and noncancer hazard estimates presented in this section are representative of theoretical exposures under the wet trench scenario. In most cases, the cancer risk and noncancer hazard estimates are driven primarily by exposure to COPCs in soil for both the "dry trench" and "wet trench" scenarios. A summary of total risks and hazards for each receptor are presented in Table 31 and shown on Figures L-1 through L-16. When summing total risks and hazards, the higher of the soil gas and groundwater risk estimates was selected so that contribution to risk from VOCs would not be 'double counted'. Consistent with DTSC vapor intrusion guidance, volatile compounds from soil were not evaluated in lieu of data in groundwater and soil gas (Cal/EPA, 2005a). Also, the total cancer risk and noncancer chronic hazards presented in this report are rounded to one siginificant digit. As a result of the rounding within the electronic calculation spreadsheets, slight differences in the summation of total cancer risk and noncancer chronic hazards may exist in Tables 31 through 34.

As previously discussed, lead was evaluated using screening levels identified for each potentially exposed population. Soil lead EPCs in the 0 to 2 feet depth interval were compared to screening levels for the commercial worker, residential, and recreational visitor populations. Consistent with the CSM, the soil lead EPCs in the 0 to 10 feet depth interval were compared to screening levels for the construction worker population only. The screening comparison is shown in Table 35 and is described for each parcel below.

The HQs and HIs reported for TPH account for exposure through both direct exposure pathways (i.e., ingestion and dermal contact) and indirect exposure pathways (i.e., inhalation). The methods used in this HHRA did not allow for the development of pathway-specific HIs, as saturation limits were considered in the evaluation of TPH. When combining the HQs for the petroleum fractions, the two types of pathways are treated differently because the indirect exposure pathway, unlike the direct exposure pathway, is physically limited by the saturation concentration in the vapor phase. For each petroleum fraction at vapor saturation concentration, the noncancer HQ from inhalation is at its maximum due to that fraction. For HQs estimated for TPH in soil and groundwater, the concentration in soil or groundwater corresponding to the vapor saturation concentration represents the upper limit for indirect exposures. When saturation is reached in a given media, pure product could be present and not pose a significant health concern. Because of this limitation, pathway-specific HIs are not reported in Tables L-19a through L-31b. However, the general pathway-specific contributions to the HI are discussed in a qualitative manner in this section.

Pathway-specific risk calculations are provided in Tables L-19a through L-31b. Risk summaries on a parcel-by-parcel basis for each receptor are shown on Figures L-1 through L-16 in Appendix L. The estimates of hazards and risks presented in this section are based on future land use at the parcels that comprise the Pier 70 Site. Results of the comparison of lead EPCs in soil against screening values for future land use at each parcel are also presented in this section (Table 35).

7.7.1 Residential/Commercial Parcels:

Exposure pathways evaluated for the on-site resident and commercial worker were: 1) dermal contact and incidental ingestion of soil; 2) indoor vapor migration of VOCs in soil gas and groundwater, and 3) inhalation of chemicals on particulates. Chemical exposures to the construction worker during Site redevelopment of the parcels slated for high density residential development were also evaluated for exposure through: 1) dermal contact and incidental ingestion of soil and groundwater; 2) outdoor inhalation of VOCs assuming both a dry trench and wet trench scenario, and 3) inhalation of chemicals on particulates.

Parcel 1: Receptor- and pathway-specific cancer risks and HIs are presented in Appendix L, Tables L-19a for the resident, L-19b for the commercial worker, and L-19c for the construction worker. At Parcel 1, groundwater data was not collected because of early refusal due to the presence of concrete.

Total lifetime incremental cancer risk associated with the soil and soil gas exposure pathways for the resident was 3×10^{-5}. The noncancer HIs for the adult and child resident were 0.7 and 5, respectively. The primary contributors to the elevated incremental cancer risk were PAHs and to a lesser extent, metals (arsenic and lead) through the incidental ingestion of soil pathway and PAHs via the dermal contact pathway. The elevated HIs were primarily due to incidental ingestion of cobalt and manganese in soil.

The commercial worker total lifetime incremental cancer risk and noncancer HI were 9×10^{-6} and 0.4, respectively. The cancer risk was driven by dermal contact with PAHs (and incidental ingestion of PAHs and arsenic in soil.

The construction worker total lifetime incremental cancer risk and noncancer HI were 3×10^{-6} and 46, respectively. The cancer risk was driven by the inhalation of cobalt on partulates. The elevated noncancer HI was due mainly to the inhalation of cobalt, manganese and nickel on particulates. Groundwater data was not available for Parcel 1. Therefore, cancer risks and HIs were not estimated for the construction worker under the wet trench scenario.

For the resident, commercial worker, and construction worker, the cancer risk estimates were within 1 x 10^{-4} to 1 x 10^{-6}. The HIs for the child resident and the construction worker were greater than 1. The commercial worker HI was below 1.

The lead EPC in soil in the 0 to 2 feet bgs interval was greater than the screening value for the resident but was below the screening value for the commercial worker. The lead EPC in soil in the 0 to 10 feet bgs interval was below the screening value for the construction worker.

Total risk summaries and media-specific risk summaries for the residential receptors are shown on Figures L-1 through L-4. Total risk summaries and media-specific risk summaries for the commercial worker receptors are shown on Figures L-5 through L-8. Total risk summaries and media-specific risk summaries for the construction worker receptors are shown on Figures L-13 through L-16.

Parcel 3: Receptor- and pathway-specific cancer risks and HIs are presented in Appendix L, Tables L-20a for the resident, L-20b for the commercial worker, and L-20c for the construction worker. Soil gas data at Parcel 3 was not evaluated because VOCs were not detected.

The total lifetime incremental cancer risk for the resident was 3 x 10^{-5}. The noncancer HIs were 3 and 17 for the adult and child, respectively. The primary contributors to the elevated incremental cancer risk were PAHs, arsenic, and lead through the incidental ingestion of soil and PAHs and arsenic through the dermal contact with soil pathway. The elevated HIs for the adult and child residents were primarily due the incidental ingestion of cobalt and manganese in soil.

The commercial worker total lifetime incremental cancer risk and noncancer HI were 9 x 10^{-6} and 2, respectively. The cancer risk was driven by dermal contact with PAHs incidental ingestion of PAHs, arsenic, and lead. The elevated HI for the commercial worker was attributable to exposures to manganese via incidental ingestion of soil and the inhalation of windblown soil particulates .

The construction worker cancer risk and noncancer HI were 9 x 10^{-6} and 214, respectively. Cancer risk was driven primarily by dermal contact with PAHs (in groundwater, incidental ingestion of PAHs in soil, and inhalation of cobalt on windblown soil particulates. The noncancer HI was attributable to the inhalation of metals (manganese, nickel, cobalt, and aluminum) on windblown soil particulates and the incidental ingestion of manganese.

For the resident, commercial worker, and construction worker, the cancer risk estimates were within the target risk range (1 x 10^{-4} to 1 x 10^{-6}). The HIs for the resident (adult and child), commercial worker, and the construction worker HIs were greater than the target HI of 1.

The lead EPC in soil in the 0-2 feet bgs interval was greater than the screening value for the resident and commercial worker. The lead EPC in soil in the 0-10 feet bgs interval was below the screening value for the construction worker.

Total risk summaries and media-specific risk summaries for the residential receptors are shown on Figures L-1 through L-4. Total risk summaries and media-specific risk summaries for the commercial worker receptors are shown on Figures L-5 through L-8. Total risk summaries and media-specific risk summaries for the construction worker receptors are shown on Figures L-13 through L-16.

7.7.2 Commercial Parcels

Exposure pathways evaluated for the commercial worker were: 1) outdoor dermal contact and incidental ingestion of soil; 2) indoor vapor migration of VOCs in soil gas and groundwater, and 3) inhalation of chemicals on particulates. Chemical exposures to the construction worker during Site redevelopment of the parcels slated for commercial development were evaluated for exposure through: 1) dermal contact and incidental ingestion of soil and groundwater; 2) outdoor inhalation of VOCs assuming both a dry trench and wet trench scenario, and 3) inhalation of chemicals on particulates.

Parcel 2: Receptor- and pathway-specific cancer risks and HIs are presented in Appendix L, Tables L-21a for the commercial worker and L-21b for the construction worker.

The total lifetime incremental cancer risk and noncancer HI for the commercial worker were 9 x 10^{-5} and 2, respectively. The cancer risk was primarily due to PAHs, arsenic, and lead in soil via the incidential ingestion and dermal contact routes of exposure. The elevated HIs were mainly attributable to the incidential ingestion of metals in soil.

For the construction worker, the total lifetime incremental cancer risk was 3 x 10^{-5} and the HI was 115. The cancer risk was primarily due to dermal contact with PAHs in groundwater, incidental ingestion of arsenic and PAHs in soil, and dermal contact with PAHs in soil. The majority of HI was attributable to the inhalation of manganese, cobalt and nickel on windblown soil particulates; incidental ingestion of manganese in soil; and incidental ingestion of and dermal contact with mercury in groundwater.

The cancer risk estimates under the commercial and construction scenarios were within the target risk range (1 x 10^{-4} to 1 x 10^{-6}). The commercial worker and the construction worker noncancer HIs were greater than the target HI of 1.

The lead EPC in soil in the 0-2 feet bgs interval exceeded the screening value for the commercial worker. The lead EPC in soil in the 0 to 10 feet bgs interval exceeded the screening value for the construction worker.

Total risk summaries and media-specific risk summaries for the commercial worker receptors are shown on Figures L-5 through L-8. Total risk summaries and media-specific risk summaries for the construction worker receptors are shown on Figures L-13 through L-16.

Parcel 4: Receptor- and pathway-specific cancer risks and HIs are presented in Appendix L, Tables L-22a for the commercial worker and L-22b for the construction worker.

The total lifetime cancer risk for the commercial worker was 2 x 10^{-4} and the noncancer HI was 2. The cancer risk was attributable to inhalation of benzene and ethylbenzene vapors migrating from groundwater to indoor air and the incidential ingestion and dermal contact with arsenic and PAHs in soil. Incidential ingestion of arsenic in soil was the major contributor to the elevated total lifetime cancer risk for the commercial worker. Of 11 soil samples analyzed, the highest arsenic concentrations in Parcel 4 were present at 448 mg/kg in soil boring G-47-EE2000 and 461 mg/kg at G-48-EE2000, both collected at a depth interval of 0 to 0.5 feet bgs. The remaining arsenic concentrations ranged from <0.25 mg/kg through 33 mg/kg. Without the two highest arsenic concentrations from the dataset, the total lifetime cancer risk, including the risk associated with VOC migration into indoor air, decreases by an order of magnitude, within the target risk range of 10-4 to 10-6 range. The noncancer HI was mainly attributable to the inhalation of TPH-gasoline vapors migrating from groundwater to indoor air and incidential ingestion of metals in soil, although no individual chemical exceeded a HQ of 1.

The construction worker total lifetime cancer risk was 1 x 10^{-5} and the noncancer HI was 99. The cancer risk was driven by dermal contact with PAHs in groundwater and the incidential ingestion of arsenic in soil. The noncancer HI was mainly due to the inhalation of metals (arsenic, manganese, and nickel) on windblown soil particulates, the incidential ingestion of arsenic in soil, and dermal contact with TPH-diesel in groundwater.

The cancer risk estimates for the commercial worker exceeded the target risk range (1 x 10^{-4} to 1 x 10^{-6}). As discussed above, arsenic in soil is the primary contributor to risk for the commercial worker. The cancer risk estimates for the construction worker were within the target risk range (1 x 10^{-4} to 1 x 10^{-6}). The estimated noncancer HIs for both the commercial worker and construction worker were above the target HI of 1.

The lead EPC in soil in the 0-2 feet bgs interval did not exceed the screening value for the commercial worker. The lead EPC in soil in the 0 to 10 feet bgs interval did not exceed the screening value for the construction worker.

Total risk summaries and media-specific risk summaries for the commercial worker receptors are shown on Figures L-5 through L-8. Total risk summaries and media-specific risk summaries for the construction worker receptors are shown on Figures L-13 through L-16.

Parcel 5: Receptor- and pathway-specific cancer risks and HIs are presented in Appendix L, Tables L-23a for the commercial worker and L-23b for the construction worker. At Parcel 5, groundwater data were not evaluated in the HHRA because samples could not be collected due to the presence of shallow bedrock.

The total lifetime cancer risk for the commercial worker was 2 x 10^{-6} and a noncancer HI of 0.2. The cancer risk was driven mainly by the incidential ingestion of arsenic in soil. The arsenic EPC was 3 mg/kg, well within background concentrations in soil. Without arsenic, the cancer risk is 3 x 10^{-7}. The cancer risk estimate under the commercial use scenario within the target risk range (1 x 10^{-4} to 1 x 10^{-6}) and is less than the regulatory target of 1 x 10^{-6} if arsenic is excluded from the risk estimate.

For the construction worker, total lifetime cancer risk was 1 x 10^{-6} and the HI was 3. Both the cancer risk and noncancer hazard were driven mainly by the inhalation of cobalt and nickel on windblown soil particulates. Groundwater data was not available for Parcel 5. Therefore, cancer risks and HIs were not estimated for the construction worker under the wet trench scenario.

The cancer risk estimates for the commercial worker and construction worker were within the target risk range (1 x 10^{-4} to 1 x 10^{-6}). The noncancer HI under the commercial scenario was less than the target HI of one but greater than 1 for the construction worker.

The lead EPC in soil in the 0 to 2 feet bgs interval did not exceed the screening value for the commercial worker. The lead EPC in soil in the 0 to 10 feet bgs interval did not exceed the screening value for the construction worker.

Total risk summaries and media-specific risk summaries for the commercial worker receptors are shown on Figures L-5 through L-8. Total risk summaries and media-specific risk summaries for the construction worker receptors are shown on Figures L-13 through L-16.

Parcel 6: Receptor- and pathway-specific cancer risks and HIs are presented in Appendix L, Tables L-24a for the commercial worker and L-24b for the construction worker.

For the commercial worker, the total lifetime cancer risk was 4 x 10^{-6} with an HI of 0. 3. The cancer risk was driven mainly by arsenic in soil through the incidental ingestion route of exposure. An arsenic concentration of 3.3 mg/kg was used as the EPC, well within the range of naturally-occurring background in Site soils. Without arsenic, the cancer risk is 1 x 10^{-6}.

The construction worker total lifetime cancer risk was 2 x 10^{-5} and the noncancer HI was 29. The cancer risk was driven by the incidental ingestion of and dermal contact with arsenic and the incidential ingestion of PAHs in soil; with lesser contributions from the inhalation of metals on winblown soil particulates, although no individual chemical exceeded a HQ of 1. The majority of noncancer hazard was due to the incidental ingestion of arsenic and thallium in soil, the inhalation of arsenic and cobalt on windblown soil particulates, and the incidential ingestion of thallium in groundwater.

The cancer risk estimates for the commercial worker and construction worker were within the target risk range (1 x 10^{-4} to 1 x 10^{-6}). The noncancer HI under the commercial scenario was less than the target HI of one but greater than 1 for the construction worker.

The lead EPC in soil in the 0 to 2 feet bgs interval did not exceed the screening value for the commercial worker. The lead EPC in soil in the 0-10 feet bgs interval did not exceed the screening value for the construction worker.

Total risk summaries and media-specific risk summaries for the commercial worker receptors are shown on Figures L-5 through L-8. Total risk summaries and media-specific risk summaries for the construction worker receptors are shown on Figures L-13 through L-16.

Parcel 7: Receptor- and pathway-specific cancer risks and HIs are presented in Appendix L, Tables L-25a for the commercial worker and L-25b for the construction worker. At Parcel 7, groundwater data was not evaluated in the HHRA because samples could not be collected due to the presence of shallow bedrock. Shallow soil gas samples were also not collected at Parcel 7 because of the presence of shallow bedrock.

The total lifetime cancer risk and noncancer HI for the commercial worker were 3 x 10^{-8} and 0.1, respectively.

For the construction worker, the total lifetime cancer risk was 4 x 10^{-6} and the HI was 11. Cancer risk was mainly driven by the inhalation of cobalt and nickel on windblown soil particulates. The noncancer HI was attributable to the incidential ingestion of cobalt in soil and the inhalation of cobalt and nickel on windblown soil particulates. Groundwater data was not available for Parcel 7. Therefore, cancer risks and HIs were not estimated for the construction worker under the wet trench scenario.

The cancer risk estimates for the commercial worker were below the target risk range (1 x 10^{-4} to 1 x 10^{-6}). The cancer risk estimates for the construction worker were within the target risk range (1 x 10^{-4} to 1 x 10^{-6}). The noncancer HI under the commercial scenario was less than the target HI of one but greater than 1 for the construction worker.

The lead EPC in soil in the 0 to 2 feet bgs interval did not exceed the screening value for the commercial worker. The lead EPC in soil in the 0-10 feet bgs interval did not exceed the screening value for the construction worker.

Total risk summaries and media-specific risk summaries for the commercial worker receptors are shown on Figures L-5 through L-8. Total risk summaries and media-specific risk summaries for the construction worker receptors are shown on Figures L-13 through L-16.

Parcel 8: Receptor- and pathway-specific cancer risks and HIs are presented in Appendix L, Tables L-26a for the commercial worker and L-26b for the construction worker.

The total lifetime cancer risk for the commercial worker was 5 x 10^{-7} with an HI of 0.004. The cancer risk was estimated based on exposure to VOCs in soil gas and groundwater. Soil data was not available for Parcel 8 from the 0 to 2 feet bgs depth interval. Therefore, cancer risks and noncancer HIs were not estimates.

The total lifetime cancer risk for the construction worker was 1 x 10^{-7} and the HI was 0.4.

The cancer risk estimates for the commercial and construction worker were less than the target risk range (1 x 10^{-4} to 1 x 10^{-6}). The noncancer HIs for the commercial worker and construction were less than the target HI of 1. The dataset for Parcel 8 was limited to data from the western half of the parcel because the eastern half of the parcel overlapped with the MGP Investigation Area. The data used to evaluate risk at Parcel 8 consisted of one soil boring at two depth intervals (5 to 5.5 feet bgs and 8.5 to 9 feet bgs), one soil gas sample, and two groundwater samples.

The outdoor commercial worker could not be evaluated for lead in soil because data were not available for the 0 to 2 feet bgs interval. The lead EPC in soil in the 0-10 feet bgs interval did not exceed the screening value for the construction worker. The lead screening was performed on two samples from the same boring (P8SB-01 at 5 and 8.5 feet bgs).

Total risk summaries and media-specific risk summaries for the commercial worker receptors are shown on Figures L-5 through L-8. Total risk summaries and media-specific risk summaries for the construction worker receptors are shown on Figures L-13 through L-16.

Parcel 9: Receptor- and pathway-specific cancer risks and HIs are presented in Appendix L, Tables L-27a for the commercial worker and L-27b for the construction worker.

The total lifetime cancer risk for the commercial worker was 2 x 10^{-5} and the HI was 2. The cancer risk was driven mainly by the incidential ingestion of arsenic, PAHs and lead in soil and dermal contact with arsenic and PAHs in soil. The noncancer HI was almost entirely attributable to the incidential ingestion of TPH-residual and dermal contact with metals in soil, although no individual chemical exceeded a HQ of 1.

For the construction worker, the total lifetime cancer risk was 4 x 10^{-5} and the HI was 138. The primary risk drivers include the incidential ingestion of arsenic and dermal contac with PAHs in groundwater. The noncancer HI was driven by the inhalation of manganese on windblown soil particulates, the inciential ingestion of thallium in soil, and dermal contact with TPH-diesel and TPH-residual in groundwater.

The cancer risk estimates for the commercial and construction worker were within the target risk range (1 x 10^{-4} to 1 x 10^{-6}). The noncancer HIs under the commercial and construction scenarios were greater than the target HI of 1.

The lead EPC in soil in the 0 to 2 feet bgs interval exceeded the screening value for the commercial worker. The lead EPC in soil in the 0 to 10 feet bgs interval exceeded the screening value for the construction worker.

Total risk summaries and media-specific risk summaries for the commercial worker receptors are shown on Figures L-5 through L-8. Total risk summaries and media-specific risk summaries for the construction worker receptors are shown on Figures L-13 through L-16.

MGP Investigation Area: Receptor- and pathway-specific risks and HIs are presented in Appendix L, Tables L-28a for the commercial worker, L-28b for the recreational park user, and L-28c for the construction worker.

Commercial Worker: The total lifetime cancer risk for the commercial worker was 7 x 10^{-5} and the HI was 0.4. Cancer risk was driven mainly by dermal contact with and incidential ingestion of PAHs and arsenic in soil and incidential ingestion of lead in soil. Total Risks for the Commercial Worker in the MGP Investigation Area are shown on Figure L-5 with pathway-specific risk summaries shown on Figures L-6, L-7, and L-8 for soil, soil gas, and groundwater, respectively.

Recreational Visitor: The recreational visitor was evaluated for exposure to COPCs in the MGP Investigation Area because the eastern half is slated for development as part of Slipways Park. The cancer risk for the recreational visitor was 1 x 10^{-4}. The noncancer HIs for the adult and child recreational visitors were 0.2 and 2, respectively. The majority of cancer risk was driven by dermal contact with and incidential ingestion of PAHs and arsenic in soil and incidential ingestion of lead in soil. The elevated HI for the child recreational visitor was driven by the incidential ingestion of metals in soil, although no individual chemical exceeded a HQ of 1. The dataset evaluated for the recreational user included the data points within the Slipways Park portion of the MGP Investigation Area and two additional soil sample locations (TGU-18 and PSB-02) associated with the MGP Investigation Area that overlaps with Parcel 8. If these data were excluded in the risk estimates for the portion of the MGP Investigation Area that is part of Slipways Park, the cancer risk and HI would remain within the same order of magnitude of cancer risk and HI calculated for the entire MGP Investigation Area.

Total Risks for the Recreational Visitor in the MGP Investigation Area are shown on Figure L-9 with pathway-specific risk shown on Figures L-10, L-11, and L-12 for soil, soil gas, and groundwater.

Construction Worker: For the construction worker, the total lifetime cancer risk was 3 x 10^{-4}. The majority of cancer risk (approximately 99%) was due to PAHs in soil, through the incidental ingestion and dermal contact routes of exposure. . The remaining 1% of the total risk was due to the incidential ingestion of arsenic in soil, the inhalation of PAHs and metals on windblown soil particulates, and dermal contact of PAHs in groundwater. For the inhalation of PAHs and metals on windblown soil particulates and the dermal contact of PAHs in groundwater pathways, no individual chemical exceeded a HQ of 1. The dataset for estimating risk included four soil samples (SPSB05, TGU-16, TGU-18, and TGU-23) which were collected below the water table at depths of approximately 9 to 10 feet bgs. Since dusts would not be generated if soils are saturated, cancer risk from chemicals adsorbed to windblown soil particulates would be overestimated for the inhalation route of exposure; however, 99% of the cancer risk is driven by the incidental ingestion and dermal contact routes of exposure.

The noncancer HI for the construction worker was 23. The noncancer HI for the construction worker was driven by dermal contact with thallium in soil and the incidental ingestion of manganese in groundwater. Incidental ingestion of soil contributed greater than 87% of the HI. Of the nine samples collected for thallium from the 0-10 ft bgs interval, there were only two detections of 0.03 mg/kg (4.5 to 5 ft bgs) and 70.5 mg/kg (4.5 to 6 ft bgs) while the remaining data was ND (<0.5 mg/kg).Total Risks for the

Construction Worker in the MGP Investigation Area are shown on Figure L-13 with pathway-specific risk summaries shown on Figures L-14, L-15, and L-16 for soil, soil gas, and groundwater, respectively.

Risk Summary for Receptors Evaluated: The cancer risk estimate under the commercial scenario was within the target risk range (1 x 10^{-4} to 1 x 10^{-6}) but the cancer risk estimate for the construction worker was greater than the upper end of the acceptable risk range. For the recreational visitor, the cancer risk was at the high end of the risk management range (1 x 10^{-4}). The noncancer HIs under the commercial scenario is less than the target HI of 1. The noncancer HIs under the construction and recreational visitor scenarios were greater than the target HI of 1.

Lead: The lead EPC in soil in the 0 to 2 feet bgs interval exceeded the screening value for the commercial worker and recreational visitor. The lead EPC in soil in the 0 to 10 feet bgs interval did not exceed the screening value for the construction worker.

Total risk summaries and media-specific risk summaries for the commercial worker receptors are shown on Figures L-5 through L-8. Total risk summaries and media-specific risk summaries for the recreational visitor receptors are shown on Figures L-9 through L-12. Total risk summaries and media-specific risk summaries for the construction worker receptors are shown on Figures L-13 through L-16.

7.7.3 Park and Open Space Parcels

Exposure pathways evaluated for the recreational visitor at the park and open space parcels were: 1) outdoor dermal contact and incidental ingestion of soil and 2) inhalation of chemicals on particulates. Chemical exposures to the construction worker during site redevelopment of the parcels slated for commercial development were also evaluated for exposure through: 1) dermal contact and incidental ingestion of soil and groundwater; 2) outdoor inhalation of VOCs assuming both a dry trench and wet trench scenario, and 3) inhalation of chemicals on particulates.

Crane Cove Park: Receptor- and pathway-specific cancer risks and HIs are presented in Appendix L, Tables L-29a for the recreational visitor and L-29b for the construction worker. Risk from VOCs in shallow soil gas was not evaluated in the HHRA because groundwater was present at shallow depths, therefore soil gas samples were not collected.

The total lifetime cancer risk for the recreational visitor was 5 x 10^{-5}. The noncancer HIs for the adult and child recreational visitor were 0.5 and 5, respectively. Cancer risk was primarily attributable to incidental ingestion of arsenic, PAHs, polychlorinated biphenyl (PCBs), and lead in soil. Dermal contact with PAHs, PCBs and arsenic in soil also contributed significantly to the total lifetime cancer risk for the recreational user. The elevated HI was driven by the incidential ingestion of metals (primarily manganese).

The construction worker total lifetime cancer risk was 7 x 10^{-6} and the HI was 68. Primary contributors to the cancer risk were hexavalent chromium via the inhalation of windblown soil particulates and the incidential ingestion of arsenic in soil. The elevated HI was mainly due to inhalation of manganese on windblown soil particulates, theincidential ingestion of mercury in groundwater, and the incidential ingestion of metals in soil, although no individual chemical has a HQ greater than 1.

The cancer risk estimates for the recreational visitor and construction worker were within the target risk range (1 x 10^{-4} to 1 x 10^{-6}). The noncancer HIs under the recreational and construction scenarios were greater than the target HI of 1.

The lead EPC in soil in the 0 to 2 feet bgs interval exceeds the screening value for the recreational visitor. The lead EPC in soil in the 0 to 10 feet bgs interval did not exceed the screening value for the construction worker.

Total risk summaries and media-specific risk summaries for the recreational visitor receptors are shown on Figures L-9 through L-12. Total risk summaries and media-specific risk summaries for the construction worker receptors are shown on Figures L-13 through L-16.

Central Plaza Park: Receptor- and pathway-specific cancer risks and HIs are presented in Appendix L, Tables L-30a for the recreational visitor and L-30b for the construction worker. Shallow soil gas data was not collected for Central Plaza Park because it is anticipated that future development will not include the construction of buildings on this parcel, therefore risk from VOCs in soil gas was not evaluated.

The recreational visitor total lifetime incremental cancer risk was 2 x 10^{-5}. The noncancer HIs for the adult and child recreational visotor were 0.1 and 1, respectively. Cancer risk was driven mainly by the incidential ingestion of PAHs and arsenic in soil and dermal contact with arsenic in soil. The arsenic EPC was 11 mg/kg, within the range of naturally-occurring arsenic. Without arsenic, risk would be 4 x 10^{-6}.

The cancer risk estimate under the recreational land use scenario with and without arsenic is within the target risk range (1 x 10^{-4} to 1 x 10^{-6}). The HI was mainly due to arsenic via the incidental ingestion of soil route of exposure, although no individual chemical exceeded a HQ of 1.

The construction worker total lifetime incremental cancer risk was 1 x 10^{-5} and the HI was 17. The drivers of the cancer risk were the incidential ingestion of arsenic in soil and dermal contact with PAHs in groundwater. . The elevated HI was mainly due the inhalation of manganese and cobalt on windblown soil particulates and dermal contact with TPH-diesel and TPH-residual in groundwater.

The lead EPC in soil in the 0 to 2 feet bgs interval exceeds the screening value for the recreational visitor. The lead EPC in soil in the 0 to 10 feet bgs interval did not exceed the screening value for the construction worker.

The cancer risk estimates for the recreational visitor and construction worker were within the target risk range (1 x 10^{-4} to 1 x 10^{-6}). The noncancer HI under the recreational scenario equals the target HI of 1 and the noncancer HI under the construction scenarios is greater than the target HI of 1.

Total risk summaries and media-specific risk summaries for the recreational visitor receptors are shown on Figures L-9 through L-12. Total risk summaries and media-specific risk summaries for the construction worker receptors are shown on Figures L-13 through L-16.

Slipways Park: Receptor- and pathway-specific cancer risks and HIs are presented in Appendix L, Tables L-31a for the recreational visitor and L-31b for the construction worker.

The total lifetime incremental cancer risk was 3 x 10^{-5}. The noncancer HIs for the adult and child recreational visitor were 0.2 and 2, respectively. Primary risk drivers were PAHs, arsenic, and lead through the incidental ingestion of soil and PAHs through dermal contact with soil. The elevated HI was due to the incidental ingestion of metals in soil, although no individual chemical has a HQ greater than 1.

The construction worker total lifetime incremental cancer risk was 1x10^{-5} and the HI was 19. Cancer risk is attributable to dermal contact with PAHs in groundwater and incidental ingestion of arsenic in soil. The elevated HI is due to the incidential ingestion of thallium in soil and groundwater.

The lead EPC in soil in the 0 to 2 feet bgs interval exceeds the screening value for the recreational visitor. The lead EPC in soil in the 0 to 10 feet bgs interval did not exceed the screening value for the construction worker.

The cancer risk estimates for the recreational visitor and construction worker were within the target risk range (1×10^{-4} to 1×10^{-6}). The noncancer HIs under the recreational and construction scenarios were greater than the target HI of 1.

Total risk summaries and media-specific risk summaries for the recreational visitor receptors are shown on Figures L-9 through L-12. Total risk summaries and media-specific risk summaries for the construction worker receptors are shown on Figures L-13 through L-16.

7.8 Uncertainties

The process of estimating risk has inherent uncertainties associated with the calculations and assumptions used. The approach used in this HHRA has been health protective whenever possible and tends to overestimate exposures. Consequently, the risk assessment also overestimates risk associated with those exposures. A discussion of the key uncertainties used in this risk assessment is presented below.

7.8.1 Data Evaluation

Data used in this risk assessment combined historic and current data at the Pier 70 Site. Over time, certain chemicals in soil, soil gas, and groundwater (i.e. petroleum hydrocarbons, SVOCs, VOCs, pesticides, and PCBs) likely biodegraded and decreased in concentrations. Natural attenuation was not accounted for in the modeling for this assessment. Therefore, the risks estimated by combining the historic and current data sets may overestimate the long-term risks to future populations.

The risk assessment included inorganic chemicals in soil that are present at naturally-occurring concentrations. In particular, arsenic at concentrations typical of background soils ranging from 2 to 13 mg/kg, is known to result in elevated cancer risk. The inclusion of inorganic chemicals in soil that are consistent with Site background concentrations resulted in an overestimate of risk.

For dioxins or furan congeners reported as “not detected” (ND), the value corresponding to the detection limit was used in estimating the EPC. Thus, use of the detection limit as a surrogate concentration for ND concentrations likely overestimates the dioxin TEQ concentrations.

In parcels adjacent to the Bay (Table 6) data from saturated soils, typically at 9 to 10 feet bgs, were included in the dataset used to calculate EPCs for soils from the 0 to 10 feet depth. These data were used in the evaluation of the construction worker receptor and may have resulted in an overestimate of risk from the inhalation of particulates in soil. However, for the COPCs that were primary risk drivers (benzo(a)pyrene in particular), the inhalation route of exposure comprised a minor percentage of the contribution to cancer risk estimates relative to the incidental ingestion and dermal contact routes of exposure.

Information collected from monitoring well TMW-28A in the MGP Investigation Area indicates that depth to groundwater in the saturated zone fluctuates from a depth of about eight to over nine feet bgs based on data provided on the GeoTracker website (State Water Resources Control Board [SWRCB] 2010) and data collected as part of this SI.

TMW-28A is adjacent to the San Francisco Bay. Due to the limited nature of the groundwater data in this area, it was assumed that the saturated zone extended to a maximum depth of 10 feet in the MGP area. While this is conservative, it is not unreasonable given the limited data and depth to water extending beyond nine feet below ground surface in recent monitoring events. The groundwater fluctuation extends to nearly 10 feet, which is the maximum depth used to derive the exposure point concentrations for the construction worker. Therefore, consideration of exposure via inhalation of dusts and direct contact with subsurface media was considered plausible. Because of this uncertainty, and to provide a reasonable bound to the cancer risk estimates at the Site, the “dry trench” construction worker scenario was also included in this risk assessment in addition to the wet trench.

PAHs are found in nearly all surface soil in urban and rural environments and are attributable to both naturally and anthropogenic sources (ATSDR, 1995). Natural sources include wild fires and volcanic activity (ATSDR, 1995). Anthropogenic sources are the most significant contributor to environmental background levels and include combustion of fossil fuels, wood burning, and various industrial activities (ATSDR, 1995). Exposures to background levels of carcinogenic PAHs typically result in cancer risks in excess of one in one million (1 x 10^{-6}) (Cal/EPA, 2002). The DTSC conducted a study to establish regional background concentrations of carcinogenic PAHs in Northern California surface soils (Cal/EPA, 2002). The mean and 95% upper confidence limit (UCL) of the mean concentrations were calculated as benzo(a)pyrene equivalents and ranged from 0.21 mg/kg to 0.4 mg/kg, respectively (Cal/EPA, 2002). PAHs in some areas of the site were in excess of these background levels. For example, the exposure point concentration for benzo(a)pyrene in the MGP investigation area was over two orders of magnitude greater than the 95% UCL background concentration. Due to the ubiquitous nature of PAHs in the environment, some contribution to PAH concentrations in surface soil detected at the site may be attributable to background sources, thus resulting in an overestimate of risks associated with Site chemicals.

Each parcel was evaluated for risks from COPCs in soil, soil gas, and groundwater. However, for certain parcels, data were not available for some media. Shallow soil data from the 0 to 2 feet depth interval was not available at Parcel 8, therefore, the outdoor commercial worker could not be evaluated. It should be noted that shallow soil samples from Parcel 8 were evaluated as part of the MGP Investigation Area, which comprised the eastern half of Parcel 8. Shallow soil gas data for this HHRA was not evaluated at Parcels 5, 7, Central Plaza Park, and Crane Cove Park. Groundwater data was not available for Parcels 1, 5, and 7. At Parcels 5 and 7, groundwater samples could not be collected because of early refusal due to concrete at Parcel 1 and the presence of shallow bedrock at Parcels 5 and 7. The lack of data from all media evaluated for each parcel resulted in an underestimate of risk for some receptors.

7.8.2 Exposure Assessment

Numerous assumptions must be made in order to estimate human exposure to chemicals. These assumptions include parameters such as daily breathing rates, soil ingestion rates, skin surface area exposed to soil, human activity patterns, and many others. Most of the exposure assumptions used in the calculation of risk for this assessment are recommended by Cal/EPA and USEPA, and are often the upper 90th or 95th percentile values. The use of 90th or 95th percentile values, when available, is recommended by the USEPA in order to estimate the "Reasonable Maximum Exposure" that may occur at a site. However, the combination of several upper-bound estimates used as exposure parameters may substantially overestimate chemical intake. Thus, the risks calculated in this assessment are therefore likely to be more conservative than may be required to be protective of public health.

Direct contact with surface soil is not likely for residents, outdoor commercial workers, and recreational visitors based on planned site development. Grading, importing soil, and new park construction will cover or remove and replace surface soil, thereby greatly reducing exposures to existing Site in the landscaped areas, parks and open spaces. The rest of the Site will be paved or covered with buildings, thus eliminating any direct contact with surface soil.

For the construction worker, it was assumed that no personal protective equipment (PPE) would be worn and that workers would be directly exposed to soil and groundwater (wet trench scenario) during development activities. Because chemical concentrations are known to exceed screening levels, and in some cases, acceptable target risk levels, workers will be required under the State of California Occupational Safety and Health Administration (OSHA) regulations to wear PPE. Further, during site redevelopment, dust control measures will be required under applicable Federal, State, and local laws. Consequently, the estimated risks to the construction worker were overestimated.

7.8.3 Fate and Transport Modeling

Uncertainty is associated with modeling any physical process. The magnitude of this uncertainty, the sensitivity of the model to uncertain parameters, and the model objectives affect how the results can be used. Two types of uncertainty exist in simulating subsurface flow and transport processes: model uncertainty and parameter uncertainty. Each type of uncertainty is discussed further below.

Model uncertainty relates to the computational methods and simplifying assumptions employed by the model code to simulate the physical system. The Johnson and Ettinger model (used to simulate subsurface soil gas migration) has been shown to adequately predict particular field-measured conditions. The code was developed under contract to the USEPA from a model previously published in a peer-reviewed journal (USEPA, 2004b; Johnson and Ettinger, 1991).

Parameter uncertainty includes measurement errors inherent in field studies as a result of equipment limitations, measurement errors, and incomplete knowledge of surface and subsurface conditions. These parameter uncertainties manifest themselves in the model as uncertainties in boundary conditions, flow parameters, and transport parameters. These in turn produce uncertainty in the model results, such as soil gas migration rates and chemical migration rates.

The uncertainties in the calculated indoor air concentrations are mostly associated with the assumed parameters and structure of a residential home or commercial building. First and most importantly, the attenuation through the slab of a house or commercial structure is difficult to characterize since actual attenuation through a building slab is difficult to measure. Factors that influence it include the degree of cracking of the slab, the permeability of the soil underlying the slab, and building construction. Buildings that are constructed with air space between the soil and the living space (such as those with open basements or crawl spaces) would have greater attenuation of chemical migration into the building because the air space serves to passively vent vapors from the soil. The model used in this HHRA did not assume open basements or crawl spaces.

Uncertainty associated with mixing height can occur if ventilation within the indoor space is good. For this model, a residential mixing height of eight feet was chosen, which is appropriate for a one-story home and conservative for a two-story home or a home with good ventilation between the first floor and an attic. A commercial mixing height of 10 feet was chosen. The effect of a change in mixing height is a simple linear extrapolation on the corresponding transfer factor. If the mixing height were doubled, the transfer factors would be reduced by a factor of two and decrease the risks by a factor of two.

Sensitivity in air exchange rate is also easily calculated, in that a doubled exchange rate reduces the transfer factors by two resulting in decreased risks by a factor of two. The air exchange rate can be different depending on whether ventilation in the building is aided by windows or doors being open or closed; the range of residential air exchange rates was estimated to be between 0.21/hour and 1.48/hour (USEPA, 2004b). The values used in this HHRA are within that range at 0.5/hour for residential and 1/hour for commercial. However, if the air exchange rates in future homes or commercial buildings are greater, the risks would be lower than presented here. Similarly, if future homes or commercial buildings have lower air exchange rates, the risks would be higher than those presented in this HHRA.

The uncertainties in the calculated emission flux of chemicals are associated with the limitations of the Johnson and Ettinger model used in this HHRA and a number of assumptions made during these calculations. First, there are inherent limitations in the model, which introduce uncertainties in the calculated flux. In particular, the Johnson and Ettinger model assumes vertical homogeneity in soil characteristics within each horizon in the vadose zone. In reality, there is variation in soil characteristics within each horizon in the vadose zone. Due to the nature of vertical variation in soil along the vadose zone, this constraint may result in either an overestimate or underestimate of the calculated flux and the resulting risks. Further, the model also does not account for horizontal transport of chemicals within the vadose zone. If presence of VOCs is highly localized (i.e., impacted area is surrounded by a clean area), horizontal transport tends to dilute the localized source of VOCs and decrease the flux of chemicals to the atmosphere. For this case, the true flux could be lower than presented in this HHRA and therefore, the calculated risks would be higher than may be required to be protective of human health.

Other conservative assumptions used in the modeling include assuming a constant groundwater source concentration through time. Relaxing this assumption would reduce calculated contaminant transport and lower calculated risks. In addition, a soil type of sand was chosen for the modeling, which resulted in a greater permeability for the model. As mentioned above, these conservative assumptions result in protective cleanup targets for each of the possible building uses in the Site.

7.8.4 Toxicity Assessment

Available scientific information is insufficient to provide a thorough understanding of all the toxic properties of each of the chemicals to which humans may be exposed. It is generally necessary, therefore, to infer these properties by extrapolating them from data obtained under other conditions of exposure, generally in laboratory animals. Although reliance on experimental animal data has been widely used in general risk assessment practices, chemical absorption, metabolism, excretion, and toxic responses may differ between humans and the species for which experimental toxicity data are available. Uncertainties in using animal data to predict potential effects in humans are introduced when routes of exposure in animal studies differ from human exposure routes, when the exposures in animal studies are short-term or subchronic, and when effects seen at relatively high exposure levels in animal studies are used to predict effects at the much lower exposure levels found in the environment. Uncertainties in the toxicological assessments for carcinogens and noncarcinogens are discussed below.

7.8.4.1 Carcinogens

First, the use of animal data presents an uncertainty in predicting carcinogenicity in humans. While many substances are carcinogenic in one or more animal species, only a small number of substances are known to be human carcinogens, raising the possibility that not all animal carcinogens are human carcinogens and that not all human carcinogens are animal carcinogens. To prevent the underestimation of carcinogenic risk, regulatory agencies generally assume that humans are at least as sensitive to carcinogens as the most sensitive animal species.

The development of CSFs for carcinogens is predicated on the assumption generally made by regulatory agencies that no threshold exists for carcinogens (i.e., that there is some risk of cancer at all exposure levels above zero). The no-threshold hypothesis for carcinogens, however, may not be valid for all substances.

7.8.4.2 Mutagenic Mode of Action

The USEPA released a guidance document titled *Supplemental Guidance for Assessing Susceptibility from Early-life Exposure to Carcinogens* ("Supplemental Guidance"), which prescribed methods for addressing the increased susceptibility to children exposed to carcinogens. These methodologies are intended to specifically address "early-life exposures that may result in the occurrence of cancer during childhood and early-life exposures that may contributed to cancers later in life" (USEPA, 2005). To account for the increased susceptibility, cancer risks were weighted by a factor of ten for exposures occurring the first two years of life, a factor of three from age two years to less than 16 years of age, and no adjustment for ages 16 years and up (USEPA, 2005). The supplemental guidance identified 12 chemicals (including benzo[a]pyrene, dibenz[a,h]anthracene, and dimethylbenz[a]anthracene) with a mutagenic mode of action for carcinogenesis (USEPA, 2005), which results in irreversible DNA damage (USEPA, 2005). Additional chemicals have since been added to expand the list to a total of 16 chemicals (USEPA, 2010d). These methodologies have been formally adopted in the development of USEPA, Region IX's regional screening levels (RSLs). However, the methods in the Supplemental Guidance have not been formally adopted by Cal/EPA or DTSC for the evaluation of contaminated sites and therefore were not implemented in this HHRA. Application of the USEPA's Supplemental Guidance in this HHRA would result in an increase in the cancer risk estimates for chemicals with a mutagenic mode of action, particularly the PAHs that contributed to risk at Parcels 1, 2, 3, 4, 6, 9, the MGP Investigation Area, Crane Cove Park, Central Plaza Park, and Slipways Park.

7.8.4.2 Noncarcinogens

In order to adjust for uncertainties that arise from the use of animal data, regulatory agencies often base the RfD for noncarcinogenic effects on the most sensitive animal species (i.e., the species that experiences adverse effects at the lowest dose). These doses are then adjusted via the use of safety or uncertainty factors. The adjustment compensates for the lack of knowledge regarding interspecies extrapolation, and guards against the possibility of humans being more sensitive than the most sensitive experimental animal species tested. The use of uncertainty factors is considered to be protective of health. In addition, when route-specific toxicity data were lacking, RfDs were extrapolated from one route to another (i.e., oral to inhalation and inhalation to oral). Due to the absence of contrary data, equal absorption rates were assumed for both routes.

7.8.5 Uncertainties in Risk

The USEPA (1989b) notes that the conservative assumptions used in risk assessments are intended to assure that the estimated risks do not underestimate the actual risks posed by a site and that the estimated risks do not necessarily represent actual risks experienced by population at or near a site.

This HHRA was conducted using a series of conservative assumptions. The use of conservative assumptions tends to produce upper-bound estimates of risk. Although it is difficult to quantify the uncertainties associated with all the assumptions used in this assessment, the use of conservative assumptions is likely to result in a substantial overestimate of exposure, and hence, risk.

7.9 Summary and Conclusions

The purpose of this HHRA was to evaluate potential human exposures and health risks associated with current Site conditions at Pier 70 and to identify areas within the Pier 70 property that require mitigation in support of decision-making during future construction and property development. Numerous investigations were conducted at the Pier 70 Site to characterize the nature and extent of chemicals in groundwater and soil. The data collected as part of this SI, as well as the applicable historical investigation data, provide the basis for this HHRA.

In order to assess whether residual chemical concentrations in soil, soil gas, and groundwater at the Site were within acceptable risk ranges based on future land uses, risks were estimated using calculated EPCs for each chemicals in each media and calculating risks for each receptor on a parcel-by-parcel basis. In the Feasibility Study, Risk-Based Target Concentrations (RBTCs) for the applicable media and receptor will be compared to residual chemical concentrations to guide remedial decisions during Site redevelopment. RBTCs represent the concentration of a chemical that can remain in the soil, soil gas, or groundwater and still be protective of human health for future land uses.

Cancer risks and noncancer HIs were calculated for each parcel and estimated for future receptors based on future redevelopment plans. The majority of total cancer risk at the Pier 70 site is attributable to exposure from COPCs, primarily metals and PAHs, in soil. The contribution of VOCs in soil gas to total cancer risk was at or less than 1×10^{-6} for all parcels evaluated. The contribution of VOCs in groundwater to total life time risk was generally less than 1×10^{-6} for the residential, commercial, and recreational park receptors. However, in the wet trench construction worker scenario, groundwater contributed to risk through dermal contact with chemicals.

Future construction workers at the Pier 70 site will be subject to the highest cancer risks from exposure to metals and PAHs in soil and groundwater during site redevelopment. However, occupational exposure to chemicals is regulated under CalOSHA and it is expected that workers will be required to wear personal protective equipment during dust-generating activities such as excavation and trenching and to prevent potential contact with groundwater that has infiltrated into excavations. Dust control measures will be implemented as required by Federal, State, and local regulations, thus further reducing worker exposure to chemicals on particulates.

A summary of cancer risks and noncancer hazards based on future redevelopment plans for specific parcels is presented below.

Parcels 1 and 3

At Parcels 1 and 3, future development plans are for residential/commercial uses. Total lifetime cancer risks for the resident, commercial worker, and construction worker were within the risk management range of 1×10^{-6} to 1×10^{-4}. Noncancer HIs were less than the target HI of one for the resident and commercial worker, but higher than 1 for the construction worker. At Parcel 1, the lead EPC in soil in the 0 to 2 feet bgs interval was greater than the screening value for the resident but below the screening value for the commercial worker. The lead EPC in soil in the 0 to 10 feet bgs interval was below the screening value for the construction worker. At Parcel 3, the lead EPC in soil in the 0 to 2 feet bgs interval was greater than the screening value for the resident and commercial worker. The lead EPC in soil in the 0 to 10 feet bgs interval was below the screening value for the construction worker.

Parcels 2, 3, 5, 6, 7, 8, and the MGP Investigation Area

For the parcels slated for future commercial development (2, 3, 5, 6, 7, 8 and the MGP Investigation Area), total lifetime cancer risks were within the risk management range of 1 x 10^{-6} to 1 x 10^{-4} for the commercial receptor. At Parcel 4, total cancer risk for the commercial worker was 2 x 10^{-4}, thus exceeding the lower end of the risk management range. The cancer risk was mainly attributable to dermal contact with benzo(a)pyrene in groundwater, ingestion of arsenic in soil, and inhalation of arsenic and cobalt on particulates. At Parcel 4, arsenic was present at elevated concentrations at two locations (G-47-EE2000 and G-48-EE2000) in the 0 to 0.5 feet bgs depth interval. Removal of these two data from the dataset used to calculate the EPC results in a decrease of total lifetime cancer risk by an order of magnitude. Therefore, it is anticipated that if these soils are removed during site development, total cancer risk will be in the risk management range of 1 x 10^{-6} to 1 x 10^{-4}.

The noncancer HIs under the commercial scenario are less than the target HI of 1 for Parcels 1, 5, 6, 7, 8, 9, and the MGP Investigation Area, while Parcels 2, 3, and 4 had HIs greater than 1.

The lead EPC in soil in the 0 to 2 feet bgs interval exceeded the screening value of 320 mg/kg for the commercial worker at Parcels 2, 3, and 9, but was below the lead screening value at Parcels 1, 4, 5, 6, and 7. Soil data for the 0 to 2 ft bgs depth interval was not available for Parcel 8.

For the construction worker, estimated cancer risks were within the risk management range of 1 x 10^{-6} to 1 x 10^{-4} at all parcels evaluated for future commercial use except at the onsite MGP Investigation Area. At the MGP Investigation Area, risk to the construction worker was 3 x 10^{-4} (for both the wet trench and dry trench scenarios) greater than the lower end of the risk management range. The primary risk drivers were PAHs, primarily benzo(a)pyrene in soil, through the incidental ingestion and dermal contact routes of exposure. Although the dataset for evaluating risks at the on site area of subsurface investigation related to the MGP Investigation Area included four samples from the saturated zone, only 1% of the contribution to risk is through the inhalation of particulates. Construction worker HIs were greater than 1 at all parcels evaluated for commercial use (both dry trench and wet trench scenarios) except at Parcel 8 where the HI was less than 1. As discussed in Section 7.7, the dataset for Parcel 8 was limited to data from one soil boring at two depth intervals (5 to 5.5 feet bgs and 8.5 to 9 feet bgs), one soil gas sample, and two groundwater samples. Elevated HIs at the majority of parcels are due to inhalation of metals on particulates and incidental ingestion of metals in soil. The construction worker lead screening value of

800 mg/kg was exceeded at Parcels 2 and 9, but was below the screening value at Parcels 1, 3, 4, 5, 6, 7, 8, and the MGP Investigation Area.

Parks and Open-Space Areas

Total cancer risks for park visitors at Central Plaza Park, Crane Cove Park, and Slipways Park were within the risk management range of 1 x 10^{-6} to 1 x 10^{-4} , with HIs at 1 (Central Plaza Park) and greater than 1 at Crane Cove Park and Slipways Park. The risk drivers at the parks were primarily metals and PAHs (mainly benzo(a)pyrene) in soil through the incidental ingestion and dermal contact routes of exposure. At Central Plaza Park, the arsenic EPC of 11 mg/kg is comparable to the 11.5 mg/kg background arsenic concentration determined for the adjacent Potrero Power Plant site (AMEC, 2009). Without the inclusion of arsenic in the risk calculations, total cancer risk was in the 1 x 10^{-6} risk range. Noncancer HIs greater than 1 were attributable to the incidental ingestion of metals in soil.

The lead EPC in soil in the 0 to 10 feet bgs interval did not exceed the screening value for the construction worker at Central Plaza Park, Crane Cove Park, and Slipways Park.

Following Site development, direct contact with surface soil is not likely for residents, outdoor commercial workers, and recreational visitors. Mitigation and remedial measures will be evaluated and may include grading, importing soil, and new construction to cover or remove and replace surface soil, thereby greatly reducing exposures to existing Site soils in the landscaped areas of the future high density residential, commercial, and park and open space developments. A risk management plan will provide specifications and details as to how risk will be mitigated and managed during redevelopment of the Pier 70 Site.

8.0 ECOLOGICAL SCREENING LEVEL RISK ASSESSMENT

8.1 Purpose and Scope

The purpose of the ESLRA is to evaluate whether the Site currently poses, or could pose after redevelopment, a potentially unacceptable risk to plants or animals at the Site (ecological receptors). The ESLRA consisted of a biological survey; development of a conceptual model, including identifying complete exposure pathways; selection and development of ecological screening levels; contaminant transport modeling, risk analysis, and risk characterization.

This ESLRA considered only the onshore portion of the Pier 70 Site. It did not include analysis of potential for ecological risk from contaminants in Bay water or sediments. However, the ESLRA acknowledges that contaminants, principally those dissolved in groundwater, could migrate to the Bay, potentially at concentrations exceeding water quality standards established to protect aquatic organisms. This ESLRA focused on the contaminants in soil at the Site and the potential for those contaminants to adversely impact terrestrial ecological receptors. The risk analysis also considers aquatic ecological receptors that could potentially be exposed to constituents in groundwater if those constituents have migrated to the Bay.

8.2 Biological Survey

Joseph Sullivan, Ph.D., a Certified Wildlife Biologist, conducted two site visits, on 25 August 2009 and 14 December 2009, to observe the Site during both the dry summer season and the rainy winter season. The objective of these surveys was not to develop exhaustive lists of the wildlife species present, but rather to gain an understanding of the ecological setting in the different seasons.

Limited, low quality habitat exists on Site for terrestrial wildlife. The majority of wildlife activity occurring on or near the Site consists of birds using the San Francisco Bay. Plant life is limited to the few areas that are not paved or do not contain buildings. During the August visit, the plants present were sparse and scattered. However, during the wet season visit in December, the vegetation at Central Plaza and Crane Cove Park had recently greened up and provided slightly better cover and food resources for wildlife. No wetlands exist on Pier 70.

During the August Site visit, two special status species were observed (Appendix M, Table M-1). California brown pelicans and double-crested cormorants were seen either perched on pilings just off shore in the Bay, or flying overhead. The only bird species observed that do not feed in the water are the rock pigeon (*Columba livia*) and common raven (*Corvus corax*). August is late in the breeding season for most bird species, so some birds that breed in the area may have already dispersed. In addition to the birds observed, old mammal scat was seen in the Central Plaza areas that could have been domestic dog, but might also have been from a nondomestic species; no tracks were present to assist with the identification. An inactive mammal burrow approximately 10 cm across occurred in a mound of dirt and debris in the Central Plaza. This burrow might be from a ground squirrel (*Spermophilus* sp.). This list represents only those species observed during the two site visits, and is not an exhaustive list.

During the December visit, California brown pelicans and double-crested cormorants were again observed. Many more species and individuals were seen in December than in August (Appendix M, Table M-1). Numerous feral cats were seen. The scent of a skunk was present near Building 6 in the northern end of what will be the redeveloped Slipways Park. Both insectivorous and seed-eating birds that would feed in terrestrial areas were seen in December that were not observed in August. The one small burrow observed during the previous site visit had vegetation growing out of it, so was determined to be inactive. A large stick nest, possibly a raptor nest, was seen near the top of one of the cranes in Crane Cove Park. Possible domestic dog scat was seen in Crane Cove Park. Two species of plants dominated the Crane Cove Park area in December, pampas grass (*Cortaderia selloana*), and sweet fennel (*Foeniculum vulgare*). Neither plant is native to the area.

In addition to the Site visits, potential special status species were identified through queries of the California Department of Fish and Game (CDFG) and U.S. Fish and Wildlife Service (USFWS) for the USGS 7.5 minute topographic quadrangles near Pier 70. The CDFG maintains the California Natural Diversity Database that can be queried through its software Rarefind (Rarefind 3.1.1). The USFWS can be queried for a list of federally listed species at its website (http://www.fws.gov/sacramento/es/default.htm). A complete list created by combining the queries of the USFWS and CDFG is in Appendix M, Table M-2. Table M-3 contains a list of those special status species (including water birds) that could occur on-site or adjacent to the Pier 70 Site considering the habitat present or the types of habitat that could be present once the Site has been redeveloped. For aquatic birds, nesting habitat is generally lacking, but these species could be present feeding in the Bay adjacent to Pier 70. For completeness, Appendix M includes all special status species identified from CDFG or USFWS lists, including aquatic species, but since the focus of this assessment is the onshore aspects of the Site, no solely aquatic species (*e.g.*, fish, benthic invertebrates, or marine mammals) are included in Table M-2 (Appendix M).

8.3 Conceptual Model

Three sources of potential exposure to contaminants exist at the Pier 70 Site (Figure M-1):

1. Contaminated soil. Plants and soil-dwelling invertebrates are directly exposed to the contaminants in soil. Animals at any level of the food web often consume some soil, so all animals on-site could be exposed directly to contaminated soil. Additionally, organisms at the Site could be exposed to contaminants in soil through the food web. Herbivorous insects, birds

or mammals, including seed-eaters, could be secondarily exposed to any contaminants taken up by plants. Invertivores could be secondarily exposed to contaminants from soil-dwelling invertebrates. Insectivores that feed on herbivorous insects would be tertiarily exposed, and predators that feed on herbivores, invertivores, or insectivores would be tertiarily or quaternarily exposed.

2. Contaminated surface water. The only surface water possible on Site would be puddles forming following rain storms. Standing water was not observed during the field investigation. Attempting to model contaminant concentrations in puddles is generally not part of an ESLRA and was not considered in this assessment.

3. Contaminated groundwater. The only organisms possibly exposed directly to groundwater are plants whose roots extend down below the water table, and soil-dwelling invertebrates that either burrow deep into the soil or might be exposed during periods of soil saturation near the surface. The plants currently on-Site do not appear to use groundwater as evidenced by the fact plants were dead or dormant during the August site visit. Burrowing animals are assumed to remain above the level of groundwater and not exposed to groundwater. This assumption is logical since burrowing animals, including earthworms, require access to air for respiration. Burrowing animals generally come to the surface when the ground is saturated because they depend on air for respiration. Consequently, this exposure pathway was not considered to be complete at the Site.

   Contaminants in groundwater at the Site may also migrate to the Bay, potentially impacting water quality and aquatic or semi-aquatic organisms. The potential impact to aquatic receptors in the Bay from contaminants in groundwater at the Site cannot be fully evaluated in this ESLRA because the nature and extent of contaminants present in Bay sediments and water adjacent to Pier 70 have not been fully characterized.

The ground surface at the Site is currently mostly paved or covered by buildings, and will remain so after redevelopment. The Master Plan envisions three primary open space areas: Crane Cove Park, Slipways Park, and Central Plaza Park. This ESLRA focuses on these three areas for analysis of soil contamination since exposure to soils in other areas of the Site is currently and will be negligible after redevelopment. These areas will consist of vegetated or landscaped areas, paved plaza or similar “hardscape”, or combinations ground surface cover and vegetation. The extent to which each of these open spaces will be paved or covered by surfaces that prevent direct contact with underlying soil, or landscaped is undetermined at this time.

For completeness, the ESLRA covers the entire Pier 70 Site, whether currently paved or planned to be paved or covered with buildings. However, the three park areas listed above are emphasized in the discussion and conclusions because those are the areas where an exposure pathway currently exists and is likely to exist once redevelopment is complete. The ecological conceptual site model is illustrated in Figure 32.

8.4 Exposure Pathways

The potentially complete exposure pathways through which contaminants at the Site could potentially significantly impact ecological receptors are:

1. Direct contact (resulting ingestion, inhalation and dermal contact) of soil-dwelling invertebrates and terrestrial wildlife to surface soil where it is exposed at the ground surface.
2. Contact of soil-dwelling organisms to subsurface soil where it is accessible. For example, burrowing animals, including invertebrates such as earthworms, can be exposed to deeper soils while in their burrows. Surface and deeper soils are assessed separately to address these two exposure pathways.
3. Contact of aquatic and semi-aquatic organisms to contaminants in groundwater, should groundwater migrate to the Bay, and those organisms' ingestion of contaminants through the food web. Only the first part of the food web in Figure M-1, colored in blue and depicting fish-eating birds, illustrating the potential connection between groundwater and aquatic or semi-aquatic organisms, is considered in this ESLRA.

8.4.1 Terrestrial Ecological Receptors' Exposure to Surface Soil

Although inhalation and dermal exposure to wildlife are possible, it is generally accepted that the majority of wildlife exposure to contaminants occurs through ingestion. Consequently, this ESLRA focuses on exposure via ingestion of soil. Throughout much of Pier 70, terrestrial organisms' exposure to Site soils is effectively blocked by pavement and buildings. However, terrestrial organisms could be exposed to contaminants in soil where it is exposed, for example uptake by plants or soil ingestion by wildlife.

Exposure could also occur via an animal's diet, for example, an herbivore eating contaminated plant matter, or a carnivore eating an herbivore. Animals belonging to each of the feeding groups except invertivores were observed on-Site. Failure to see invertivores during two visits cannot be taken as proof that none exist on-site. For example, urban rats (*Rattus norvegicus*) are likely present, and as part of their omnivorous diet would likely consume soil-dwelling invertebrates. Where the soil surface is exposed, the potential exists for contaminants to move through the food web from the contaminated soil through the food web and possibly accumulating in top-tier predators.

Current terrestrial receptors are limited. The biological survey discussed in Section 8.2 identified few terrestrial mammals present. That survey was not exhaustive, but was adequate to indicate the limited biological resources present. Since much of the Site is paved or covered with buildings, plants are present only in Crane Cove Park and Central Plaza Park, the only currently unpaved areas. During the summer months, live plants are almost nonexistent. During the winter, many more seasonal plants take advantage of the rainy season and occur in these areas. These plants attract some seed-eating birds such as finches. Pigeons and feral cats are present year-round.

8.4.2 Aquatic Ecological Receptors' Exposure to Contaminants in Groundwater

Aquatic receptors include all the fish and the invertebrates that inhabit the sediments and the water. Additionally, many semi-aquatic wildlife species occur along the Bay shoreline. These include many ducks, gulls and other fish-eating birds. Seals and sea lions also occur in the area. These receptors could be exposed to contaminants from groundwater by feeding on aquatic organisms and direct contact with the water should the groundwater migrate to the Bay. Semi-aquatic species such as many gulls and ducks may spend time on land in Crane Cove Park, though currently little nesting cover or food items are available on land. The duck species observed were "sea ducks" that eat aquatic organisms. The degree of exposure these ducks and gulls could receive from spending a little time on the shoreline of Pier 70 is quite low.

8.5 Contaminant Fate and Transport

8.5.1 Hydrologic Transport

8.5.1.1 Surface Water and Sediment Transport

No streams occur on Pier 70. With the exception of portions of the areas designated as the Central Plaza Park and Crane Cove Park, the Site is either paved or contains buildings. The surface water from the paved areas is collected in storm drains that discharge to the City and County of San Francisco's combined sewer system, and is not discharged directly into the Bay (see Figure F-9, in Appendix F to *Port of San Francisco Storm Water Management Plan*, Port of San Francisco, December, 2003). Central Plaza Park is surrounded by paved areas making it unlikely that surface water could easily flow off-site to the Bay. Crane Cove Park is directly adjacent to the Bay, so surface water could flow across the site directly into the Bay. Since there are no streams or other water bodies on-site, the potential for off-site movement of sediments does not exist.

8.5.1.2 Groundwater Transport

Pier 70 is directly adjacent to the San Francisco Bay and groundwater levels indicate flow generally across the Site into the Bay.

8.5.2 Physical Transport

The potential for physical transport off site is limited because the majority of the site is effectively capped with either pavement or buildings. However, any contaminants exposed at the ground surface could be transported via wind to the Bay.

8.6 Environmental Screening Levels for Ecological Receptors

The goal for this ESLRA was not to quantify ecological risk, but rather to determine whether the potential for an unacceptable level or risk to exist. To that end, contaminant concentrations at the Site were compared with established environmental screening levels. No exposure assessments for individual ecological receptors were considered.

8.6.1 Soil Contaminants

In general, environmental screening levels for soil that have been published for terrestrial receptors (plants, birds and mammals) were used to assess risk to terrestrial receptors. For contaminants for which soil screening levels have not been published, an ecological soil screening level was calculated based on the omnivorous raccoon (Procyon lotor). The raccoon's diet consists of a variety of food items including small mammals, fish, both aquatic and terrestrial invertebrates, and plant matter. Such a broad diet would expose raccoons to most food resources available at the Pier 70 site. Raccoons are a realistic model since they have the potential to occur on the site currently and once it has been redeveloped. Calculations for screening levels developed specifically for this assessment are in Appendix M, Table M-14.

8.6.2 Groundwater Contaminants

The potential for direct exposure of terrestrial receptors to groundwater at the Site is assumed not to exist. However, exposure could result from the movement of groundwater into San Francisco Bay. This ESLRA used the Water Board's ESLs for protection of aquatic life in marine environments (Water Board, 2008a, Table F-2b) to evaluate potential risk from contaminants in groundwater.

8.6.3 Assessment Endpoints

An assessment endpoint is defined by the U.S. EPA as "an explicit expression of the environmental value to be protected, operationally defined as an ecological entity and its attributes" (EPA, 1998). For this ESLRA, assessment endpoints focused on terrestrial receptors for the soil assessment, and Bay-dwelling receptors for the groundwater assessment. Three principal criteria are used to select ecological values that may be appropriate for assessment endpoints: (1) ecological relevance, (2) susceptibility to known or potential stressors, and (3) relevance to management goals. Of these, ecological relevance and susceptibility are essential for selecting assessment endpoints that are scientifically defensible (EPA, 1998). The Pier 70 Site is too disturbed to constitute a functioning ecological community, and has been modified to such a degree that many ecological functions have been disrupted. Therefore, the assessment endpoints focused on organism-level endpoints. These will include adverse effects such as mortality, reproductive effects, and gross anomalies (EPA, 2003a).

For the assessment of soil contamination, the assessment endpoints selected are:

- Protection of avian and mammalian omnivore reproduction
- Protection of avian and mammalian granivore reproduction
- Protection of avian and mammalian carnivore reproduction

Reproduction is a more sensitive endpoint than survival. Many of the contaminants on-site are known to produce adverse reproductive effects. Therefore these endpoints should be protective of other less sensitive or vulnerable exposed ecological resources.

For the assessment of groundwater contamination, the assessment endpoints selected are:

- Protection of growth and survival of Bay-dwelling shellfish
- Protection of growth and survival of Bay-dwelling fish

Growth and survival are common endpoints to determine impacts to aquatic species. Many of the contaminants on-site are known to produce adverse effects on growth and survival of aquatic species. Therefore these endpoints should be protective of other less sensitive or vulnerable exposed ecological resources.

8.7 Measurement Endpoints

8.7.1 Inorganic Constituents

In this ESLRA, ecological screening levels were used as measurement endpoints. Published ecological screening values for metals and cyanide in soils and marine water are listed in Appendix M, Table M-4. The assessment of inorganic constituents included all the data collected in all sampling efforts from 1989 to present that met data quality standards. Since these inorganic constituents do not readily degrade or dissipate, using all the data is deemed appropriate.

8.7.2 Polycyclic Aromatic Hydrocarbons (PAHs)

Published ecological screening values for PAHs in soils and marine water are listed in Appendix M, Table M-5. The assessment of PAHs includes the data collected from 2007 through 2009. Since PAHs could degrade or dissipate, limiting the data to only the most recent samples is deemed appropriate.

8.7.3 Dioxins, Furans, and Polychlorinated Biphenyls (PCBs)

Published ecological screening values for dioxins and furans in soils are listed in Appendix M, Table M-6. No published ecological soil screening levels are available for PCBs. The calculations used to develop screening levels from toxic reference values are presented in Table M-14. The assessment of dioxins, furans, and PCB's includes the data collected since 2007, the only period during which these constituents were analyzed. These constituents were not detected in groundwater.

8.7.4 Volatile Organic Compounds

Published ecological screening values for volatile organic compounds in soils and marine water are listed in Appendix M, Table M-7. The calculations used to develop screening levels from toxic reference values are presented in Table M-14. The assessment of volatile organic compounds includes the data collected from 2007 through 2009. Since volatile organic compounds could degrade or dissipate, limiting the data to only the most recent samples is deemed appropriate.

8.7.5 Total Petroleum Hydrocarbons

Published ecological screening values for TPH in soils and marine water are listed in Appendix M, Table M-8. The assessment of TPH's includes the data collected from 2007 through 2009. Since TPH could degrade or dissipate, limiting the data to only the most recent samples is deemed appropriate.

8.7.6 Pesticides

Pesticides are not assessed as part of this ESLRA. Only four pesticides (b-BHC, endosulfan I, gamma-chlordane, and heptachlor epoxide) were identified in quantifiable concentrations in soil, and they were identified only at a single sample (P5SB-03) location in Parcel 5. No pesticides were identified in groundwater samples.

8.8 Methods

8.8.1 Data Selection

All the data selected and used in this ESLRA are included in Tables M-15 through M-29 in Appendix M. The contaminants in the soils closest to the surface (0 to 6 feet bgs) pose the greatest risk to ecological receptors so only those were used to assess risk to all non-soil dwelling animals. Since samples were collected during a number of studies, the sampled depths differed. The soil in some locations is covered with pavement or other non-soil layers preventing sampling at the surface. The assessment of inorganic constituents includes the data collected in all sampling efforts from 1989 to present. Since these inorganic constituents do not readily degrade or dissipate, using all the data is deemed appropriate. Soil samples of unknown depths are excluded from the assessment because the assessment focused on either the surface soils or those within the upper six feet for burrowing wildlife.

Data used for surface soil analyses consisted of the samples from each location collected nearest the soil surface down to a depth of 6 feet. For example, if a location had samples collected at multiple depths of two, six and 10 feet, only the data from the sample from two feet is used. The deeper samples are not included in the assessment. However, if a location had samples collected at 6 and 10 feet, the sample from six feet is used. Finally, if only samples existed from 10 feet, no samples are included.

In the analysis of soil exposure to burrowing animals, the intent is to analyze data from the top six feet below the soil surface. In this analysis, if multiple samples exist within the upper six feet, all the sample depths are included and the maximum value is selected for the assessment. However, if no samples are available within the upper six feet, but samples existed from less than 10 feet in depth, the shallowest samples are used. The rationale being that these samples probably represent the soils down to six feet fairly well. However, if only samples from greater than 10 feet exist, no data from that location are included in the analysis.

Sampling for groundwater also occurred at varying depths. The maximum concentration for any sample location is used rather than selecting a particular depth. As is appropriate for an ESLRA, such an approach is the most conservative.

8.8.2 Risk Assessment Modeling

In this ESLRA, the assessment modeling consists of a direct comparison between screening levels and soil or groundwater concentrations. Each sample point is assessed to determine whether the soil or groundwater at that location exceeds the screening level. No statistical summarizing of data across the site was performed prior to comparing the soil or groundwater concentration to the screening level. Wherever the soil or groundwater concentration exceeds the screening level, the potential for risk exists.

ESLRAs are designed to have conservative assumptions so if the assessment indicates little or no potential for risk, risk managers can be confident that such a conclusion is appropriate. However, if a screening level assessment shows there is a potential for risk, additional, higher tier assessments are required to determine the likelihood of actual harm to the ecological receptors.

8.9 Analysis Phase

8.9.1 Contaminant Migration in Groundwater

The most direct route for risk to aquatic receptors that occur in the San Francisco Bay is from the movement of groundwater from Pier 70 into the Bay. This ESLRA compared the concentration of contaminants in groundwater throughout the Site to screening levels protective of marine aquatic species. If the contaminant concentration in groundwater is less than the screening level, the potential for risk once it migrates to Bay water is very low. If groundwater concentrations are greater than the screening levels, exceedance factors of 10 and 100 are used to consider the level of potential for risk once the groundwater discharged into the Bay.

Processes occur in the subsurface that reduce chemical concentrations in groundwater as it migrates toward a discharge point such as the Bay including: hydrodynamic dispersion, sorption, chemical and biological transformation, dilution in the tidal mixing zone and dilution upon discharge to the Bay. Physical, chemical, and biological processes tend to reduce groundwater concentrations during transport. At the tidal mixing zone, Bay waters move inland through the aquifer at high tide mixing with groundwater. As groundwater discharges at low tide, concentrations in groundwater are further reduced as the relatively small volume of groundwater discharges into the large volume of Bay water. Thus, it is not appropriate to compare surface water quality criteria directly to groundwater concentrations. USEPA (2001) acknowledges that such direct comparison (a dilution-attenuation factor of 1.0) overestimates the concentration in the surface water body, but states that the most appropriate dilution attenuation factor will be site specific. USEPA (2006), NOAA (2006), and the Water Board (2006) all acknowledge that a 10 times dilution factor is appropriate for estimating concentrations of chemicals in groundwater discharging to surface water bodies and a dilution factor of 10 has been accepted by the regulators for groundwater at Hunters Point Shipyard (Sultech, 2007). Therefore, the selection of exceedance factors of 10 and 100 are somewhat arbitrary, but can be used for discussion purposes.

8.9.2 Inorganic Constituents—Surface Exposure

Comparisons of shallow soil concentrations with ecological soil screening levels indicate that many inorganic constituents exceed these levels. Total cyanide was detected in soil in a single sample, at a depth of 10 feet with no detections near the surface. Chromium VI occurred in only two samples and do not exceed the ecological soil screening level (8.0 mg/kg). Three of the 19 remaining inorganic constituents included in the assessment (Appendix M, Table M-9 and Figure M-2) do not exceed their ecological soil screening level at any sampling location. These inorganic constituents are beryllium, cadmium, and molybdenum with screening levels of, 4.0, 12, 40 and 20 mg/kg, respectively. Of the remaining inorganic constituents only vanadium exceeds its ecological soil screening levels of 200 mg/kg and only in areas of the Site outside Crane Cove Park, Central Park Plaza and Slipways Park. Barium exceeds its screening level of 750 mg/kg in Crane Cove Park only, and silver exceeds its screening level of 20 mg/kg in Crane Cove Park and elsewhere. Antimony exceeds its ecological soil screening level of 20 mg/kg in Central Plaza Park and elsewhere at Pier 70. Thallium exceeds its screening level of 1.0 mg/kg immediately adjacent to Central Park Plaza and in Slipways Park. Selenium and nickel exceed their screening levels of 10 and 150 mg/kg, respectively, in Slipways Park and in Crane Cove Park. All of these constituents also exceed their ecological soil screening levels elsewhere on the Site. Mercury slightly exceeds its screening level of 10 mg/kg in Slipways Park (11 mg/kg), and exceeds its screening level to a slightly greater extent in Crane Cove Park (13.4 and 17 mg/kg) and Central Plaza Park (13 and 19 mg/kg). Cobalt exceeds its ecological soil screening level of 40 in Crane Cove Park and Central Plaza Park. Arsenic, copper, lead, and zinc exceed their screening levels of 20, 230, 200, and 600 mg/kg, respectively, at multiple sampling locations in Crane Cove Park, Central Park Plaza and Slipways Park, as well as in other areas of the Site. Chromium exhibits the most widespread distribution of exceedances of its screening level of 0.4 mg/kg in numerous locations in all three areas of Crane Cove Park, Central Park Plaza, and Slipways Park, and also across the entire site.

Numerous metals in surface soil across the Site exceed ESLs, including soil in Crane Cove Park and Slipways Park, with chromium exceeding ESLs most frequently. Antimony, arsenic, barium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc in soil all also have the potential to pose an unacceptable risk to ecological receptors at the Pier 70 site.

8.9.3 Inorganic Constituents—Burrowing Animals

Exposure for burrowing animals is assessed for soils from the surface generally down to six feet. When no samples were collected at a location less than to 6 ft in depth, but samples occurred between six and 10 feet, the slightly deeper samples are used. In general, the risk potentially posed to burrowing animals is similar to that posed to surface ecological receptors (Table M-8 and Figure M-6, Appendix M). Within Crane Cove Park, Central Park Plaza, and Slipways Park, there is a trend toward higher concentrations in the deeper soils leading to a greater number of exceedances for individual constituents. Potentially unacceptable risk to burrowing animals could result from the exposure to the same group of metals as for surface soils.

8.9.4 Inorganic Constituents—Groundwater

Dissolved concentrations of antimony, beryllium, chromium, molybdenum, selenium, thallium, and vanadium do not exceed their respective screening levels at any location on the Site (Table M-9 and Figure M-10, Appendix M). Dissolved barium, cadmium, lead, mercury, nickel, and silver exceed applicable screening levels by between 1X and 10X their screening levels in some portion of the site. Dissolved silver exceeds at one location near the southwest corner of Crane Cove Park, roughly 560 ft from the Bay. Dissolved barium exceeds its screening level at a single location in Parcel 9, approximately 400 ft from the Bay. Dissolved lead exceeds its screening level at three locations throughout the Site including a single location in Crane Cove Park, approximately 200 feet from the Bay and a single location in Slipways Park approximately 100 feet from the Bay. Dissolved mercury also exceeds its screening level at a single location, but mercury exceeds its screening level in Parcel 6, approximately 300 feet from the Bay. Dissolved cadmium exceeds its screening level at a single location, also in Parcel 9, but only 170 feet from the Bay. Finally, dissolved nickel exceeds its screening level at numerous locations across with Site with one location in Crane Cove Park less than 50 feet from the Bay.

Dissolved cobalt, copper, and zinc all exceed their screening levels of 3.0, 3.1, and 81 µg/L, respectively, in at least one location by greater than 10X. Dissolved zinc exceeds its screening level at two locations by between 1X and 10X and at a single location in Parcel 9 by more than 10X, approximately 170 feet from the Bay. Dissolved copper exceeds its screening by between 1X and 10X in numerous locations, and it exceeds it screening level by more than 10X at one location in Parcel 8, approximately 450 feet of the Bay. Dissolved cobalt exceeds its screening level by between 1X and 10X at numerous locations, and by more than 10X at two locations. One of these locations occurs within 50 feet of the Bay in Crane Cove Park.

Dissolved arsenic exceeds its screening level of 0.14 µg/L by between 10X and 100X in numerous locations across the site. It exceeds it screening level by more than 100X or more at five locations. One location in Slipways Park is less than 60 feet from the Bay, and a location in Crane Cove Park is less than 50 feet from the Bay.

8.9.5 Polycyclic Aromatic Hydrocarbons—Surface Exposure

Only pyrene exceeds it ecological soil screening level of 0.1 mg/kg in near surface soils. Exceedances occur across the site, including Crane Cove Park, Central Park Plaza, and Slipways Park (Table M-11 and Figure M-3, Appendix M). The concentrations of PAHs in surface soils, with the exception of pyrene, appear to exhibit little potential for risk to ecological receptors.

8.9.6 Polycyclic Aromatic Hydrocarbons—Burrowing Animals

The distribution of PAH concentrations exceeding ESLs within six feet bgs assessed for exposure of burrowing animals is quite similar to that seen for surface soils (Table M-10 and Figure M-7, Appendix M). Only pyrene exceeds its ESL and pyrene concentrations above the ESL occur across the site, including Central Park Plaza, Slipways Park and Crane Cove Park. Therefore, the only PAH included in this assessment exhibiting a potential for unacceptable risk to burrowing animals is pyrene.

8.9.7 Polycyclic Aromatic Hydrocarbons—Groundwater

Most PAHs concentrations in groundwater exceed their marine screening level protective of aquatic life (Table M-10 and Figure M-11, Appendix M). Of the PAHs assessed, only 2-methylnaphthalene, acenaphthene, acenaphthylene, and fluorene did not exceed their respective screening level. Anthracene, dibenzo(a,h)anthracene, fluoranthene, , naphthalene, phenanthrene, and pyrene all exceed their screening levels of 0.730, 0.049, 8.0, 21.0, 4.6, and 2.0 µg/L, respectively, by 1 to 10X. Anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene all exceed their respective ESL only in Parcel 9. All of these compounds, except naphthalene have at least one of the locations exceeding its screening level within 50 feet of the Bay. The one location where naphthalene exceeds its screening level is approximately 160 feet from the Bay.

Benzo(g,h,i)perylene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene exceed their screening levels of 0.10, 0.049, 0.048 µg/L by between 10X and 100X in some locations. Benzo(g,h,i)-perylene and benzo(k)-fluoranthene exceed applicable ESLs by 10X in Parcel 9 only, with at least one location within 50 feet of the Bay. Indeno(1,2,3-cd)pyrene also exceeds its screening level in Parcel 2. Concentrations exceeding ESLs are scattered throughout the site, including benzo(g,h,i)perylene in Slipways Park, and benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene in Slipways Park and Crane Cove Park.

Some PAH concentrations in groundwater exceed the ESL by 100X or more in Parcel 9. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and chrysene exceed their screening levels of 0.027, 0.014, 0.029, and 0.049 µg/L in Parcel 9 by more than 100X. Each of these PAHs has a number of locations where their screening levels are exceeded by 10X, including Slipways Park. All four compounds exceed their screening levels by 1X in Crane Cove Park, among other areas, and all except benzo(a)anthracene also exceed their screening level by 1X in Slipways Park.

Parcel 9 shows the greatest number of exceedances for PAHs in groundwater. Most of the PAHs assessed exceed their marine screening levels for the protection of aquatic life by at least 1X with four PAHs having exceedances of greater than 100X their screening levels. To determine whether any of these compounds pose an actual risk to aquatic life in the Bay, a site-specific attenuation factor needs to be defined. Also, since some of the elevated PAH concentrations occur a fair distance from the Bay, it will need to be determined to what extent these compounds are actually migrating to the Bay.

8.9.8 Dioxins, Furans, and PCBs—Surface Soils

None of the furans assessed exceed their ecological soil screening levels equal to 0.00004 mg/kg (Table M-6) in surface soils at any location at the Site (Table M-11 and Figure M-4, Appendix M). All of the dioxins exceed their screening levels of 0.0000002 mg/kg (Table M-6) in one area of Parcel 4, but none exceed their screening levels in Central Park Plaza, Crane Cove Park, or Slipways Park. One PCB compound, Aroclor 1254, exceeds its screening level of 0.00025 mg/kg only in Crane Cove Park. Aroclor 1260 exceeds its screening level of 0.00014 mg/kg in Crane Cove Park as well as other areas of the site, but does not exhibit any exceedances in Central Park Plaza or Slipways Park. PCBs, but not dioxins and furans, could pose an unacceptable risk to ecological receptors based on their near surface soil concentrations in Crane Cove Park.

8.9.9 Dioxins, Furans, and PCBs—Burrowing Animals

None of the furans assessed exceed their ecological soil screening levels in the slightly deeper soils assessed for potential risk to burrowing animals at any location at the Site (Table M-11 and Figure M-8, Appendix M). All of the dioxins exceed their screening levels in one area of Parcel 4, but none of them exceed their screening levels in Central Park Plaza, Crane Cove Park, or Slipways Park. Aroclor 1254 exceeds its screening level only in Crane Cove Park. Aroclor 1260 exceeds its screening level in Crane Cove Park as well as other areas of the site, but does not exhibit any exceedances in Central Park Plaza or Slipways Park. Again, PCBs could pose an unacceptable risk to burrowing animals based on the soil concentrations in Crane Cove Park.

8.9.10 Dioxins, Furans, and PCBs—Groundwater

Groundwater samples were not analyzed for dioxins or furans. Dioxins and furans have a low water solubility and are not be found at significant levels in water except adsorbed onto solid particles in suspension. Groundwater samples were analyzed for PCBs, but no PCBs were detected (see Table M-11, Appendix M). Therefore, there is no indication that PCBs pose an unacceptable risk to aquatic life in the Bay.

8.9.11 Volatile Organic Compounds—Surface Soil

No volatile organic compound exceeds its ecological soil screening level at any location on Site (Table M-12, Appendix M). Therefore, there is no evidence that volatile organic compounds will pose an unacceptable risk to surface-dwelling ecological receptors at Pier 70.

8.9.12 Volatile Organic Compounds—Burrowing Animals

No volatile organic compound exceeds its ecological soil screening level in the slightly deeper soil samples used to assess risk to burrowing animals at any location on Site (Table M-12, Appendix M). Therefore, there is no evidence that volatile organic compounds will pose an unacceptable risk to burrowing animals at the Pier 70 Site.

8.9.13 Volatile Organic Compounds—Groundwater

Because volatile organic compounds in groundwater degrade over time, only samples collected since 2007 were assumed to be representative of existing conditions and used to assess potential risk to aquatic life in the Bay. No volatile organic compound exceeds its marine screening level protective of aquatic life in groundwater samples collected at any location on Site (Table M-12, Appendix M). Therefore, there is no evidence that volatile organic compounds in groundwater at Pier 70 will pose an unacceptable risk to aquatic life in the Bay.

8.9.14 Total Petroleum Hydrocarbons—Surface Soils

No published ecological soil screening level exists for diesel fuel (TPHd), and no toxicity values could be found to develop a screening level for this assessment. To allow an assessment of TPHd, the screening levels for gasoline (TPHg) and motor oil (TPHmo) are each compared to the soil concentrations of TPHd across the Site. If the toxicity of TPHd is closer to TPHg with its lower screening level of 20 mg/kg, designated TPHd(g), exceedances occur in many locations across the site, including many locations in Central Park Plaza, Slipways Park and Crane Cove Park. However, if the toxicity of TPHd is closer to that of TPHmo with a screening level of 200 mg/kg, designated at TPHd(mo) no exceedances occur in Slipways Park, and only a single exceedance occurs in each of Central Park Plaza and Crane Cove Park.

TPHg only exceeds its ecological soil screening level at a single location in Parcel 4 (see Table M-13 and Figure M-5, Appendix M). No exceedances occur in Central Park Plaza, Slipways Park, or Crane Cove Park. TPHmo exceeds it screening level in many locations across the site, including many locations in Central Park Plaza, Crane Cove Park, and Slipways Park. Therefore, it is possible that TPHd might pose a potentially unacceptable risk to surface-dwelling ecological receptors, but the toxicity of TPHd first needs to be determined. TPHmo, but not TPHg exhibits a potential for an unacceptable ecological risk at the Pier 70 Site.

8.9.15 Total Petroleum Hydrocarbons—Burrowing Animals

Again, the assessment of TPHd compared the screening levels of TPHd(g) and TPHd(mo) to the concentrations of TPHd found in the slightly deeper soils used to assess the potential risk to burrowing animals (Table M-13 and Figure M-9, Appendix M). So if the toxicity of TPHd is closer to TPHg, exceedances occur in many locations across the Site, including many locations in Central Park Plaza, Slipways Park, and Crane Cove Park. However, if the toxicity of TPHd is closer to that of TPHmo, no exceedances occur in Slipways Park, and only a single exceedance occurs in Central Park Plaza and two in Crane Cove Park.

TPHg only exceeds its ecological soil screening level at a location in Parcel 4 and a location in Parcel 9, but no exceedances occur in Slipways Park or Crane Cove Park. TPHmo exceeds it screening level in many locations across the Site, including many locations in Central Park Plaza, Crane Cove Park, and Slipways Park. Again, it is possible that TPHd might pose a potentially unacceptable risk to burrowing animals, but the toxicity of TPHd first needs to be determined. TPHmo, but not TPHg exhibits a potential for an unacceptable risk to burrowing animals at the Pier 70 site.

8.9.16 Total Petroleum Hydrocarbons—Groundwater

Marine screening levels protective of aquatic life are available for all three constituents, including TPHd. None of the constituents exceed their screening level in Slipways Park. TPHmo and TPHd exceed their screening levels of 210 µg/L at 1X in Crane Cove Park at locations within 50 feet of the Bay (Table M-13 and Figure M-12, Appendix M).

TPHg exceeds its screening level of 210 µg/L at 1X in Parcel 9 within a little more that 100 feet from the Bay, and by 10X at approximately 150 feet from the Bay. TPHg exceeds its screening level by 1X and 10X at additional locations, but only in Parcel 9. A few of these exceedances occur in the area of Parcel 9 immediately adjacent to Slipways Park.

TPHd and TPHmo exceed their screening levels by 100X in the same locations close to the Bay where TPHg exceeds its screening level at 10X, within 100 to 150 feet from the Bay. Both TPHg and TPHmo exceed their screening levels by 1X within 50 feet of the Bay in Parcel 9. Additional locations, mostly within Parcel 9 and farther from the Bay exhibit exceedances ranging from 1X to 100X for TPHd and TPHmo. The potential exists for TPHs in the form of TPHd, TPHg and TPHmo to pose an unacceptable risk to aquatic life in the Bay if the groundwater containing these constituents migrates to the Bay. Prior to making a final determination, an attenuation factor specific to the Pier 70 site will need to be developed.

8.10 Risk Characterization

In an ESLRA, only the potential for risk is determined. To quantify the risk or to estimate the likelihood that an unacceptable risk is present, additional assessment is necessary. This ESLRA also focused solely on the potential risk posed by contaminants within the onshore portion of the site. Therefore, only soil and groundwater contamination is considered. The soil assessment focused on the three areas that are not anticipated to be entirely covered by pavement or contain buildings, *i.e.*, Crane Cove Park, Central Park Plaza and Slipways Park, although it is likely that portions of the ground surface each of these open spaces will be covered with some type of "hardscape" and that existing surface soil will be covered or replaced with soil suitable to support landscaping.

To characterize potential risk to ecological receptors, contaminant concentrations present at the site were compared with applicable ecological screening levels. Risk to terrestrial receptors was assessed using ecological soil screening levels. The potential risk posed by contaminated groundwater migrating to the San Francisco Bay was assessed using screening levels established for protection of marine aquatic life. In this screening assessment, no attenuation or dilution factor is available to account for the dilution that occurs when the groundwater encounters the large volume of water in the Bay. Arbitrary exceedance factors of 1X, 10X, and 100X are used. If a site-specific attenuation factor can be developed, this screening assessment lays the groundwork for assessing potential risk from groundwater migrating to the Bay.

In its current state, Pier 70 has few terrestrial ecological receptors present. Much of the site contains buildings or is paved, greatly limiting the opportunities for plants or animals to inhabit the site. The conversion of Crane Cove Park, Central Park Plaza, and Slipways Park to "open space" with new landscaping will improve the likelihood that wildlife will inhabit the area, and the vegetation planted as part of the redevelopment could be exposed to contaminants in the soil.

The inorganic constituents, mostly comprised of metals, most frequently exceed ecological soil screening levels. All the metals that exceed their screening level in surface soils, also exceed screening levels applicable to the burrowing animal assessment. The potential for unacceptable risk to ecological receptors within Crane Cove Park, Central Park Plaza, and Slipways Park exists from numerous metals in the soil including: antimony, arsenic, barium, chromium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc.

Pyrene is the only PAH that exceeds its ecological soil screening level, and it does so in both the surface soil assessment and the burrowing animal assessment. No furans or dioxins exceed their ecological soil screening level in either Slipways Park or Crane Cove Park. Aroclors 1254 and 1260 both exceed ESLs in Crane Cove Park, but not in Central Park Plaza or Slipways Park. No volatile organic compounds exceed their ecological soil screening levels. TPHmo exceeds its ecological soil screening level in Central Park Plaza, Slipways Park, and Crane Cove Park. TPHg does not exceed its ecological soil screening level in any of the three areas. Since no screening level is available for TPHd, it is compared to the screening levels for both TPHg and TPHmo. Depending on which is more appropriate, TPHd either exceeds the screening level in only Crane Cove Park and Central Plaza Park, or in all three areas. The potential for unacceptable risk to ecological receptors exists from pyrene, PCBs and the TPHs.

Groundwater contamination is sufficient for some constituents to potentially pose a risk to aquatic life in the Bay, depending upon the extent of dilution and attenuation of contaminant concentrations during migration toward the Bay. Groundwater concentrations for many constituents collected within 50 to 150 feet of the Bay exceed the marine screening levels by more than 100X. Total cyanide and many dissolved metals exceed their screening levels by 10X, and arsenic exceeds its screening level by more than 100X. There is the potential for risk to aquatic life in the Bay from cyanide and a number of metals. These metals are arsenic, barium, cadmium, cobalt, copper, lead, mercury, nickel, silver, and zinc.

Numerous PAHs exceed their marine screening levels by more than 100X within Parcel 9. The PAHs that potentially pose a risk to aquatic life in the Bay are benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene. Dioxins and furans were not measured in groundwater. PCBs were not detected in groundwater. No VOCs exceed their marine screening levels. TPHd, TPHg and TPHmo exceed their screening levels by more than 10X or 100X within Parcel 9. Therefore, there is the potential for unacceptable risk to aquatic life in the Bay from some PAHs and TPH.

8.11 Uncertainty analysis

Imperfect knowledge of factors that could be known and the inherent randomness of the natural environment create uncertainty regarding the conclusions about potential risk. The site visits conducted were adequate to understand the ecological setting at Pier 70, but two visits are not sufficient to document all the potential ecological receptors that could be present. For example, a large bird nest was observed in Crane Cove Park. The species using that nest was not observed. The presence of nocturnal species was not investigated. While no special status species were observed using the onshore portions of the Site, it cannot be ruled out that special status species could occur in the onshore portions. However, the lack of an exhaustive list of the species using the Site does not take away from the conclusions drawn regarding which constituents present in soil or groundwater present a potential ecological risk.

The principal exposure pathway considered for the soil assessment is ingestion, including direct ingestion of contaminated soil. It is likely that dermal and inhalation exposure can occur, particularly for burrowing animals. In general, dermal- and inhalation-specific ecological screening levels are not available. Toxicity data for dermal and inhalation exposures necessary for the development of the screening levels is generally lacking for any group other than mammals. With the exception of burrowing animals, it is generally accepted that the majority of exposure is derived from ingestion. While a degree of uncertainty is introduced by not directly considering these pathways, it is standard practice in an ESLRA to focus on the ingestion pathway.

Additionally, drinking from standing water that forms puddles following a rainstorm is a possible route of exposure not considered. No standing water was observed following rain events during the SI, and surface water samples were not collected as part of the site investigation. Attempts to model the dissolution of constituents from soil to standing puddles is not standard practice in a ESLRA. Failure to consider the exposure from this pathway could slightly underestimate the level of total exposure. However, we do not believe including exposure from puddles would change conclusions regarding potential ecological risk from soil exposure.

Six constituents (aroclor 1254, aroclor 1260, 1,2,4-trimethylbenzene, chloromethane, o-xylene, and p-isopropyltoluene) lack published screening levels. For these constituents, the soil ecological screening level was developed based on the raccoon. Selection of a different species would have altered the screening level because the assumed diet would have changed, but the toxicity values used to develop the screening level would remain the same. The raccoon's omnivorous diet makes it a good choice for a single representative species for developing a screening level. Any uncertainty introduced by developing a screening level based on the raccoon is outweighed by the benefit of being able to include these constituents in the assessment.

For VOCs, inclusion of soil concentrations from deeper soils is likely to overestimate the surface concentrations since volatile compounds are likely to dissipate more quickly from nearer the ground surface. For nonvolatile compounds, the effect on concentrations would depend on the source of the contamination. If the source is from the surface, the deeper soils would likely under represent the surface concentrations. If the source is from horizontal movement within the deeper soils, it is possible the use of deeper soils could overestimate the exposure.

The groundwater assessment as presented is a conservative approach since groundwater concentrations are compared directly to marine screening levels. As discussed above, groundwater concentrations in groundwater potentially migrating to the Bay will be reduced through chemical and biological processes, and will be further diluted by Bay water upon discharge. Tidal mixing studies conducted at Mission Bay indicated that a dilution attenuation factor of 9.7 was reasonable within a 50-foot tidal mixing zone, and that at Pier 64 a chemical concentration reduction of 65% occurred within a 30-foot tidal mixing zone (Sultech, 2007). The exact degree of attenuation and dilution occurring at Pier 70 is not known. Therefore, it is not known at this time to what degree the risk has been exaggerated by this conservative approach.

8.12 Conclusions

In its current state, Pier 70 poses limited opportunities for terrestrial wildlife and plants. Most of the Site is paved or contains buildings. Once redevelopment is complete, the open space established in Central Park Plaza, Crane Cove Park, and Slipways Park will enhance the Site’s attractiveness to urban wildlife and wildlife that might occur along the waterfront. New park construction may or may not include native plants.

The current ESLRA concludes that the potential exists for unacceptable risk to ecological receptors from the several contaminants present on Pier 70. Cyanide was not detected in any soil samples selected for inclusion in this assessment, but numerous metals exist in sufficient concentrations to exceed their ecological screening levels, and therefore, these metals pose a potential risk to terrestrial ecological receptors. As discussed in Section 6, the majority of metals concentrations exceeding screening levels are within background concnetraion ranges for soil and serpentinite rock with the exception of arsenic , copper, lead, nickel, mercury, and zinc on Parcels 1, 2, 3, 6, 8, 9 and Central Plaza, Crane Cove and

Slipways Parks. Total cyanide as well as some metals, in their dissolved state, also occur at sufficiently high concentrations in groundwater to pose a potential risk to aquatic life should they migrate to the Bay.

Pyrene is the only PAH in soil to pose a potential risk to terrestrial ecological receptors. No furans, dioxins or VOCs are considered a potential ecological risk. PCB Aroclors 1254 and 1260, and TPH potentially pose an unacceptable risk to terrestrial ecological receptors. Following Site development, direct contact with surface soil is not likely for terrestrial organisms. Grading, imported soil, and new construction will cover or remove and replace surface soil, thereby greatly reducing exposures to existing Site soils in the landscaped areas of the future high density residential, commercial, and park and open space developments. The rest of the Site will be paved or covered with buildings, thus eliminating any direct contact with surface soil. The only organic constituents concluded to potentially pose an unacceptable risk to aquatic life in the Bay via the migration of groundwater are PAHs and TPH.

This ESLRA was conservative in approach and potential risks identified will be further evaluated as part of the upcoming FS, and during development of the Site RMP.

9.0 SUMMARY AND CONCLUSIONS

This environmental SI for Pier 70 characterized upland Site conditions, and the HHRA and ESLRA identified potential health risks that contamination could pose to future Site users. The risk assessment findings do not suggest significant potential for risk to current site occupants or visitors, or a need for soil or groundwater remediation that would substantially, adversely impact the feasibility of future development as envisioned in the Master Plan.

Soil at the Site is typical of Bay fill deposits. It contains naturally-occurring asbestos and heavy metals, as well as introduced metals, PAHs, TPH, and PCBs. Shallow soil in some areas exhibits characteristics of California-regulated hazardous waste (Figure 29). Metals, including arsenic, cadmium, chromium, copper, lead, mercury, vanadium, and zinc are present in soil throughout the site at concentrations exceeding ESLs. Naturally-occurring asbestos and most of the metals (arsenic, cadmium, copper, chromium, nickel, vanadium, and zinc) are components of serpentine bedrock present beneath the Site and in the fill material. Concentrations of these constituents found in soil at Pier 70 are likely to be significantly attributable to the presence of native serpentine rock in the fill material rather than primarily attributable to contamination from hazardous materials formerly used at the site. The concentrations of metals found in soil at Pier 70 are within the range of those found in fill soils throughout the Port or other filled land, such as the Oakland Army Base, Eastshore State Park, and Mission Bay area. PAHs are also ubiquitous in soil at Pier 70 at concentrations commonly found in Bayshore fill. PAHs are associated with a wide variety of industrial operations and are the primary component of MGP waste.

VOCs in groundwater and soil gas are generally below applicable ESLs established for evaluating risk of vapor intrusion into indoor air, if buildings exist or are constructed over contaminated land.

A mixture of degraded petroleum hydrocarbons is present as NAPL in soil and as globules in groundwater within a portion of Parcel 9 (Figure 30). This material is not present in sufficient quantity to form a separate or continuous layer floating on the groundwater. It is not volatile or soluble in groundwater, as evidenced by the absent or low concentrations of dissolved TPH, VOCs, and PAHs in groundwater samples, and negligible concentrations of VOCs in soil gas samples collected in the vicinity. The physical properties of the NAPL measured as part of this SI, including composition, specific gravity, interfacial tension, and percent pore saturation in soil, indicate that the NAPL in Parcel 9 is nonvolatile, insoluble, highly viscous, and essentially immobile. Sampling results from monitoring wells installed at the Bay margin indicate that NAPL is not present, consistent with the conclusion that NAPL is not migrating to the shoreline.

Soil and groundwater in the southeast portion of Pier 70, adjacent to the Potrero Power Plant have elevated concentrations of PAHs in shallow soil within 0 to 10 feet below ground surface. Pacific Gas and Electric (PG&E) is investigating environmental impacts associated with MGP operations formerly located at the adjacent Potrero Power Plant and also provided results from soil borings that they advanced within the Pier 70 Site. Those samples contained extremely high concentrations of PAHs, which increased with depth. The highest concentrations were found in the deepest samples, at 20 feet bgs. PG&E’s assessment of the extent that DNAPL that has migrated onto Port property is ongoing and PG&E plans additional investigation of the extent of DNAPL impacts at Pier 70.

The HHRA evaluated potential human exposures and health risks associated with current Site conditions at Pier 70, and identified areas within the Pier 70 property that require mitigation during future construction and property development. The highest risks identified were to construction workers from exposure to metals and PAHs in soil and groundwater during site development activities. For other receptors, risk is within the acceptable risk range, or exposure pathways are incomplete. Following Site development, direct contact with surface soil is not likely for residents, commercial workers, and recreational visitors. Future site cover, i.e. hardscaped buildings, roads, sidewalks and/or soil cover including landscaping and parks, will eliminate key exposure pathways at the Site.

The ESLRA evaluated the need for additional site-specific ecological risk assessment and/or mitigation of potential ecological risk. The ESLRA was limited to the upland portion of the Site and did not evaluate potential impact to offshore habitat. Potential risks to terrestrial organisms result from exposure to pyrene, PCBs, and TPH in shallow soil. As discussed above for human receptors, future Site development will generally mitigate exposure to shallow soil. Potential risks to marine organisms from exposure to cyanide and dissolved metals in groundwater were also identified, though the estimate of risks associated with contaminant migration to the Bay may be overly conservative. To fully assess ecological risks offshore, groundwater impacts must be considered in conjunction with an offshore biological survey and surface water and sediment quality.

The next step in the Pier 70 Environmental Investigation process will be to evaluate potential measures to remediate and/or mitigate potential health risks. This evaluation will consider potentially applicable remediation alternatives with respect to effectiveness in achieving cleanup goals, consistency with development objectives, cost, and duration. Potentially feasible remedies may include engineering controls (e.g. removing, replacing, or capping soil) to reduce potential risks and institutional controls (e.g. deed restrictions, soil management measures) to manage potential health risks. A risk management plan will provide specifications and details on how risk will be mitigated and managed during future construction, operation and maintenance.

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TABLES

Table 1
Historical Site Operations
Pier 70 Environmental Site Investigation
San Francisco, California

Parcel	Site Operations	
Crane Cove Park	1900	Occupied by Union Iron Works for shipbuilding and slip area.
	1914	Uses were same as 1900. The land next to Parcel 1 was filled since 1900 and occupied by Hooper Lumber Company.
	1950	Uses were same as 1914. Additional use of plating operation was also identified.
	1958-1976	Slipways 1 through 3 filled.
	1991	Uses were reported same as 1950, however, was listed as occupied by Southwest Marine Shipyard.
	1999	Uses were reported same as 1950, however, was listed as occupied by San Francisco Drydock Corporation.
Parcel 1	1900	Used as lumber yard and boat building.
	1914	Occupied by C.W. Kneass's Boat Company, and John Twigg & Sons Boat Building.
	1987	Occupied by Bay Area Marine Institute for boat building and maritime training.
	1999	The parcel was reported to be vacant.
Parcel 2	1900	Occupied by Union Iron Work for lumber storage and office.
	1950	Remained as office use, but not listed for lumber storage.
	1987	Same uses as 1950, however, the parcel was listed as occupied by Todd Shipyard Corporation.
	1991	Same uses as 1987, however, the parcel was listed as occupied by Southwest Marine Shipyards.
	1999	Same uses as 1987, however, the parcel was listed as occupied by San Francisco Drydock Corporation.
Parcel 3	1900	Occupied by Union Iron Work for residential lodging.
	1950	Occupied by Bethlehem Steel Corporation and used for office only.
	1987	Occupied by Todd Shipyard for parking.
	1991	Same uses as 1987, however, was listed as occupied by Southwest Marine Shipyards.
	1999	Same uses as 1987, however, was listed as occupied by San Francisco Drydock Corporation.
Parcel 4	1900	Occupied by Union Iron Work and Pacific Rolling Mills. Primary uses for machine shop and foundry.
	1975	Occupied by Bethlehem Steel Corporation.
	1987	Same as 1975, but the parcel was occupied by Todd Shipyard Corporation.
	1991	Same as 1987, but the parcel was occupied by Southwest Marine Shipyard.
	1999	Same as 1987, but the parcel was occupied by San Francisco Drydock Corporation as training center.

Table 1
Historical Site Operations
Pier 70 Environmental Site Investigation
San Francisco, California

Parcel	Site Operations	
Parcel 5	1900	Occupied by Pacific Rolling Mills Company. Primary use as machine shop.
	1914	Occupied by US Steel Product. Primary use as warehouse.
	1975	Occupied by US Steel Product. Primary use as automobile storage.
	1987	Occupied by City and Tow for automobile storage.
Parcel 6	1900	Occupied by Pacific Rolling Mills Company. Primary use as foundry.
	1914	Occupied by US Steel Product. Primary use as warehouse.
	1941	Primary use as machine shop, transformer house, plating shop, and slipways.
	1975	Small portion of area listed as machine shop, and southern part of the parcel was listed for auto storage.
	1987	Primarily used for auto storage.
Parcel 7	1900	Residential land use atop Irish Hill.
	1941	Buildings 16, 32, 48 constructed as part of the WWII shipyard expansion. Buildings associated with the Plate Shop (Building 12) on Parcel 5.
	1987	Building was found and occupied by City and Tow.
Parcel 8 and Slipways Park	1900	Occupied by Pacific Rolling Mills Company. Primary use as steel works, foundries, coal storage, plating shop, and gas producers.
	1941	Developed as part of WWII shipyard expansion. Shipyard use includes laydown, welding platform and Slipway 8.
	1974	Slipway filled and area paved.
Parcel 9, BAE Ship Repair	1900	Occupied by Union Iron Works and used as shipbuilding yard, plating shop, boiler room, flange shop, foundry area, and dry dock. In addition, portion area was occupied by Pacific Rolling Mills Company for iron storage yard.
	1987	Occupied by Todd Shipyard Corporation and used for press room, plating shop, and machine shop.
	1991	Same uses as 1987, however, was occupied by Southwest Marine Shipyard.
	1999	Same uses as 1987, however was occupied by San Francisco Drydock Corporation.

Based on the review of Sanborn Maps from 1900, 1914, 1950, 1975, 1987, 1989, 1991, and 1999 (T&R, 2009).

See Figures 3 and 4 for historic and current land uses.

Table 2
Historical Site Information Summary
Pier 70 Environmental Site Investigation
San Francisco, California

Pier 70 Master Plan Reuse Area	Source Area Location	Source Area's)	Source Area Determination Rationale	Potential Contaminants of Concerns	Chemical Analyses Information	Remediation	Remarks	Document Title
Crane Cove Park and Parcel 1	B & C Metals Potential Public Access Area. The area currently occupied by B & C Metals. From 19th Street north approximately 300 feet. Includes southern two thirds of Slip 4.	Historical use including Hazardous Waste Storage	Metal scrapping operations, storage of inoperable vessels, possible hazardous materials storage, poor housekeeping.	Metals, TPH-motor oil, VOCs, PCBs, dioxins, and SVOCs	Surface soil sample collected in July 2000 northeast of the building occupied by B & C Metals were not detected above Industrial PRG. Results from samples collected south of the building and in the yard occupied by B & C Metals showed VOC, and asbestos not detected above Industrial PRG. PAHs, arsenic, chromium, and iron exceeded Industrial PRG Industrial. TPH-motor oil exceeded the ESL. Arsenic PRG is below the estimated background level based on literature values.	None	--	Phase I ESA for Pier 70, Mixed Use Opportunity Area, corner of Illinois St and 20th St, SF CA 94107, Volume I of II,Tetra Tech, August 1998. Pier 70 Mixed Use Opportunity Area, SF, CA, Phase II Brownfields Target Site Assessment Report, Ecology and Environment, Inc, November 2000.
Crane Cove Park	Slip 2	Historical use including sandblasting	A Preliminary Assessment, dated January 17, 1992, indicated that sandblasting waste, paint-based products, cleaning solvents, VOCs, SVOCs, and metals from ship maintenance operations could discharge.	Metals and PAHs	One soil sample collected in the former slip area in July 2000 was analyzed for VOCs, TPHs, PAHs, metals, asbestos. Results showed detections of arsenic above Industrial PRG. One soil sample collected adjacent to the west had detects of PAHs and Arsenic above Industrial PRG.	None	--	Phase I ESA for Pier 70, Mixed Use Opportunity Area, corner of Illinois St and 20th St, SF CA 94107, Volume I of II,Tetra Tech, August 1998. Pier 70 Mixed Use Opportunity Area, SF, CA, Phase II Brownfields Target Site Assessment Report, Ecology and Environment, Inc, November 2000.
Crane Cove Park	Slips 3 and 4	Historical use and fill material	A Preliminary Assessment, dated January 17, 1992, indicated that sandblasting waste, paint-based products, cleaning solvents, VOCs, SVOCs, and metals from ship maintenance operations could discharge.	Metals, VOCs, SVOCs, PAHs, dioxins, and PCBs	Soil samples were analyzed for TPH-gasoline, diesel, motor oil, Cam 17 Metals, VOCs, SVOCs, PCBs, cyanide, and asbestos. Results showed that metals, SVOCs, and PCBs were detected above the ESLs. Soil samples collected in July 2000 only detected arsenic above Industrial PRG. Groundwater samples were analyzed for TPH-gas, diesel and motor oil, and CAM 17 metals, VOCs, SVOCs, and PBCs. Results indicated that no analytes were detected above the ESLs.	None	--	Phase I ESA for Pier 70, Mixed Use Opportunity Area, corner of Illinois St and 20th St, SF CA 94107, Volume I of II,Tetra Tech, August 1998. Site Investigation, Pier 70 Northeast Shoreline, Treadwell & Rollo, January 21, 2008. Pier 70 Mixed Use Opportunity Area, SF, CA, Phase II Brownfields Target Site Assessment Report, Ecology and Environment, Inc, November 2000.
Crane Cove Park	Potential Utility Corridor (an extension of 19th Street)	Historical use	Shipbuilding Support Operations Bay Infilling	VOCs, TPH, PAHs, and CAM 17 Metals	Surface and Subsurface soils analyses included VOCs, TPH, PAHs, metals, and asbestos. TPH, VOCs, and asbestos were not detected above Industrial PRG. PAHs, arsenic, chromium, lead, and iron exceeded PRGs. Groundwater samples were analyzed for VOCs, TPH, PAHs, total metals conductivity, and TDS results showed 10 metals and TDS exceeded Industrial PRG. VOCs and PAHs were not detected.	None	Arsenic PRG is below the estimated background level based on literature values.	Pier 70 Mixed Use Opportunity Area, SF, CA, Phase II Brownfields Target Site Assessment Report, Ecology and Environment, Inc, November 2000. Site History Report and Work Plan City Tow Pier 70 San Francisco, CA, Iris Environmental, February 7, 2002.
Crane Cove Park		PCB Transformer	A discharge of PCB transformer oil inside Building 50 caused by vandalism in early 2002. Historical use of railroad line.	PCBs	PCB analysis of confirmation soil samples. All confirmation samples were below 10 mg/kg.	In 2007, approximately 275 cubic yards of soil were excavated and disposed off-site. Soil confirmation samples showed that the remedial action objective (ROA) was met. Approximately 40,000 gallons of groundwater was pumped, treated and discharged into the San Francisco sewer system.	All soil with a PCB concentration of 10 mg/kg or greater was removed.	Final Closure Report, PCB Removal Action, Building 50, Pier 70, Port of San Francisco, San Francisco, California, AEW Engineering, May 2008.

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Crane Cove Park	Northeastern Shoreline encompassing the entrances to Slips 2, 3, and 4.	Ship Building and Repair	Historical use for heavy industrialized shipyard facilities.	TPH-gas, diesel, motor oil, PAHs, Cam 17 metals, PCBs, Dioxins, Furans, OCPs, VOCs, SVOCs, Cyanide, Asbestos	Sand blast grit analysis detected elevated PAHs and metals. Discrete sandblast grit samples collected from the ground surface of Slip No. 4. Soil samples analyzed for TPH-gas, -diesel, -motor oil, 17 Metals, VOCs, SVOCs, PCBs, cyanide, asbestos. Groundwater: TPH-g, -d, -mo, CAM 17 metals, VOCs, SVOCs, PBCs. TPH-gas was detected in soil up to 0.99 mg/kg, TPH-diesel up to 23.5 mg/kg, TPH-motor oil up to 2,070 mg/kg. VOCs were not detected. SVOCs were not detected. Cyanide was not detected. 14 of the 17 metals were detected in all 23 samples. PCBs were detected up to 3.81 mg/kg in 14 of the 23 samples above both the ESL and PRGs of 0.74 mg/kg. Groundwater: TPH-d detected in one sample at 0.171 mg/L and TPH-mo detected at 0.342 mg/L. VOCs were not detected, SVOCs were not detected, 3 of the 17 metals were detected in the samples. Barium up to 1.5 mg/L, (above the ESL), Molybdenum at 0.11 mg/L, and Zinc at 0.064 mg/L. PCBs were not detected. Sandblast grit: Molybdenum at 0.11 mg/L, and Zinc at 0.064 mg/L. PCBs were not detected. Sandblast grit: TPH-g, -d, not detected, SVOCs not detected, 13 of the 17 metals detected.	This report recommends that the soil be excavated and disposed that engineering controls be implemented to prevent direct contact with the soil.	--	Site Investigation, Pier 70 Northeastern Shoreline, San Francisco, California, Treadwell & Rollo, January 21, 2008.
Sewer Easement adjacent to Parcels 1, 2, 3, 4, 6 and 9 and Crane Cove Park	Illinois Street and 20th Street within Port property.	UST naturally occurring asbestos and metals	Crystalline serpentine was identified in the serpentine bedrock along Illinois Street. Soil samples collected from a boring drilled near the UST area adjacent to building 113 identified elevated concentration of TPH-diesel.	Asbestos, TPH, LUFT metals	Chrysolite was detected up to 5% in bedrock samples along Illinois Street. TPH at 790 ppm from a bedrock sample collected in the assumed vicinity of the UST area near Building 113. The investigation was performed to evaluate potential contamination and disposal classification of excavated material during the planned modification of the combined sanitary sewer and stormwater drain system.	No information	--	Hazardous Materials Investigation of the Mariposa Facilities Project Area, ERM-West, July 1990.
Parcel 1 and Crane Cove Park	Numerous oil distribution facilities located along west side of Illinois Street between 19th Street and Mariposa Street	USTs/ASTs	Sanborn map dated 1950 identifies numerous oil depot and distribution facilities along west sie of Illinois Street. These facilities are identified as Hancock Oil Company (3 steel gasoline ASTs), Seaside Oil Company's Oil Depot (4 steel gasoline ASTS), Distribution Plant for General Petroleum Company (4 steel ASTS), Crescent pacific Oil Company (3 steel ASTs), and the Newalk Company Oil Distribution Plant (4 steel oil ASTs).	These facilities are located adjacent to each other along Illinois Street. These facilities are located up-gradient direction from Pier 70 based on reported groundwater flow direction. TPH associated with these facilities may have impacted groundwater beneath the site. Some of these facilities continue to be identified on Sanborn maps dated 1985, 1987, 1989, 1991, and 1999.	No information	No information	- -	EDR Sanborn Maps (Worl Plan)
Parcel 2	Building 36	Plating/Welding	Welding shed, equipment and material storage	Metals, VOCs, TPH-g, TPH-d, TPH-mo, BTEX, and MTBE	July 2003 data indicated that surface soil samples collected in the vicinity of Building 36 detected concentrations of PAHs, arsenic, lead and asbestos above Industrial PRGs. TPH-motor oil was detected above the RWQCB's ESL. VOCs not detected above Industrial PRGs.	None	--	Phase I ESA for Pier 70, Mixed Use Opportunity Area, corner of Illinois St and 20th St, SF CA 94107, Volume I of II,Tetra Tech, August 1998. Pier 70 Mixed Use Opportunity Area Expanded Phase II Targeted Brownfields Assessment Report, Ecology and Environment, Inc. January 2004.

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Parcel 2	San Francisco Drydock in the vicinity of Buildings 40, 101, 102, and 104 UST 106 was located on north side of Building 101 between the inset of the L-shaped building and a loading ramp. The 1,500-gallon fuel oil UST was in an underground concrete vault.	Historical Shipbuilding Support Operations/USTs	PAHs and metals exceeded Industrial PRG 10 gallons of lubricating oil identified in the sub-basement in Building 101. UST 106 was removed in January 1988. Elevated concentrations of petroleum hydrocarbons and oil and grease in soil and groundwater from samples collected from within the excavation area. Approximately 1/8-inch of floating product was observed on the water table.	TPH-g, TPH-d, TPH-mo, BTEX, MTBE, Metals, oil and grease	Surface soil samples analyzed for VOCs, TPH, PAHs, metals, asbestos. VOCs, and asbestos not detected above Industrial PRG. PAHs, arsenic, chromium, lead, and iron exceeded Industrial PRG. Arsenic PRG is below the estimated background level based on literature values. TPH-motor oil was detected above the RWQCB's ESL. Soil samples from UST Excavation had TPH (specific hydrocarbons not defined) up to 3,200 ppm and oil and grease up to 4,045 ppm. TPH was detected at 16,000 ppm in groundwater within the excavation had no or TPH-gas and TPH-diesel at 8 ppm, BTEX detected n soil at the capillary fringe in the assumed downgradient direction from the vault (approximately 20 feet away). A grab groundwater sample contained TPH-diesel at 1,100 ppb, but TPH-G and BTEX were not detected.	No remediation was performed after UST 106 was removed. Free product observed on the water table in tank excavation and was removed using sorbent pads prior to the excavation backfill.	--	Phase I ESA for Pier 70, Mixed Use Opportunity Area, corner of Illinois St and 20th St, SF CA 94107, Volume I of II,Tetra Tech, August 1998 Pier 70 Mixed Use Opportunity Area, SF, CA, Phase II Brownfields Target Site Assessment Report, Ecology and Environment, Inc, November 2000. Subsurface Investigation for Port of San Francisco, Pier 70 San Francisco, CA, Tetra Tech, December 1997.
Parcel 2	Buildings 102 and 104	Powerhouse	PCB transformer inside Buildings 102 and 104. Several electrical transforms and four industrial compressors identified to use PCB-containing dielectric fluids observed in Building 102 in 1998. Transformers identified to use PCB-containing dielectric fluids observed in Building 104 in 1998.	PCBs	None Performed	No information	Equipment appeared in good shape at the time of the site visit in 1998. No signs of leakage observed. 1982 document inventoried an aggregate quantity of 168 gallons of PCB-containing fluids within Building 102 and 104.	Phase I ESA for Pier 70, Mixed Use Opportunity Area, corner of Illinois St and 20th St, SF CA 94107, Volume I of II,Tetra Tech, August 1998.
Parcel 3 and Parcel 4	Convoy Company	Hazardous Waste Storage	A SFDPH letter to Convoy Company indicated that a Port Fire Department inspection on October 21, 1987 documented spills of hazardous materials and waste, and a faulty nozzle on a drum possible containing oil, hydraulic fluid, or antifreeze.	TPH, PAHs, VOCs, PCBs, dioxins and CAM 17 Metals	November 2000 data indicated that subsurface soils samples collected in 1999 were analyzed for SVOCs, VOCs, PAHs, and Metals. PAHS, arsenic, and chromium were detected above Industrial PRG. Surface soil collected in July 2000 analyzed for VOCs, TPH, PAHs, metals, asbestos: VOCs, TPH, and asbestos not detected above Industrial PRGl. PAHs, arsenic and chromium exceeded Industrial Industrial.	None	Exact boundary of site was not identified, but may be south of 20th street.	Phase I ESA for Pier 70, Mixed Use Opportunity Area, corner of Illinois St and 20th St, SF CA 94107, Volume I of II,Tetra Tech, August 1998. Pier 70 Mixed Use Opportunity Area, SF, CA, Phase II Brownfields Target Site Assessment Report, Ecology and Environment, Inc, November 2000.
Parcel 3 and Parcel 4	South of 20th Street	Historical Shipbuilding Support Operations	PAHs and metals in soil exceeded Industrial PRG July 2000	PAHs, and metals	Subsurface soil only. Analyses included VOCs, TPH, PAHs, metals, and asbestos: VOCs, TPH, and asbestos not detected above USEPA Industrial PRG. PAHs, Arsenic and chromium exceeded Industrial PRG.	None	High arsenic levels in fill. Arsenic PRG is below the estimated background level based on literature values.	Pier 70 Mixed Use Opportunity Area, SF, CA, Phase II Brownfields Target Site Assessment Report, Ecology and Environment, Inc, November 2000. Site History Report and Work Plan City Tow Pier 70 San Francisco, CA, Iris Environmental, February 7, 2002.

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Parcel 4	Nine leaking and rusted transformers mounted on the roof of a warehouse located south of Operational Area 2 of City Tow located in the area outside Buildings 14 and 21. Building 14 was historically a boiler room. No information on the exact transformer locations.	Hazardous Waste Storage	Port records document a fire on Pier 70 in November 1980 that damaged a substation causing PCB contamination on the asphalt floor areas and equipment. Subsequently the Port identified and removed all potential PCB containing equipment.	PCBs and Dioxin	Wipe samples of the asphalt ground surface collected within Operational Area 2 of City Tow detected a maximum concentration of PCBs at 48 micrograms per square foot. A maximum concentration of PCBs was reported at 2 micrograms per square foot from an asphalt core sample within Operational Area 2 of City Tow.	In response to the fire and subsequent PCB contamination, the Port remediated the asphalt floor area and equipment in the substation and identified and disposed of all possible equipment containing PCBs on Pier 70. This led to the discovery of the nine leaking and rusted transformers on the warehouse roof. These transformers were drained, flushed, and removed. A maximum concentration of 8 micrograms per square foot was detected on the asphalt surface. USEPA Region IX reviewed the information regarding the PCB cleanup on Pier 70 and concluded in 1982 that "the Port's extensive decontamination and removal work appears to have remediated most of the problems which were noted in our investigations and has brought the Port substantially into compliance with PCB regulations."		Site History Report and Work Plan City Tow Pier 70 San Francisco, CA, Iris Environmental, February 7, 2002.
Parcel 4	Four Former USTs associated with Building 113	USTs Machine Shop	Two USTs removed in 1990. Status not known. It is assumed that this document was referring to the removal of these two USTs. Two additional USTs filled with sand in 1992, Status not known. Historical site operation.	TPH-g, TPH-d, TPH-mo, BTEX, MTBE, PAHs, VOCs, and CAM 17 Metals	Samples were taken during the two UST removals in 1990. Sample media and results not known. Odor and discoloring were observed in the soil, a sheen was observed on the water in the open tank excavation. A UST unauthorized release form indicated that unknown quantaties of diesel fuel and oil were discovered during UST removal activities. The form indicated that remedial action has not been taken and cleanup is pending.	Not determined.	Exact locations of these tanks have not been confirmed.	Phase I ESA for Pier 70, Mixed Use Opportunity Area, corner of Illinois St and 20th St, SF CA 94107, Volume I of II,Tetra Tech, August 1998. Phase I ESA for Pier 70, Mixed Use Opportunity Area, corner of Illinois St and 20th St, SF CA 94107, Volume II of II,Tetra Tech, August 1998.
Parcel 4	Buildings 113, 114, and 115	Machine Shops and Foundary	Oily substance observed on the floor of Building 113. Historical Site Operation	TPH, PAHs, VOCs, and CAM 17 Metals.	Hydrocarbon fuel fingerprinting of the oily material in the eastern portion of Building 113 was determined to be Creosote.	Not determined.	Tetra Tech assumed that the creosote had seeped out of the floor and recommended that the area of the floor be capped or removed.	Phase I ESA for Pier 70, Mixed Use Opportunity Area, corner of Illinois St and 20th St, SF CA 94107, Volume I of II,Tetra Tech, August 1998 Pier 70 Maritime Use Area Phase I Brownfields Environmental Site Assessment Report, Ecology and Environment, March 2001.
Northeastern portion of Parcel 4, and northwestern portion of future Central Plaza	UST Area, east of Building 113 where Former UST 104, 105, UST 3, and UST 4 were located. USTs 3 and 4 were located approximately 150 north of the Operational Area 2 of City Tow. Tank tightness test records indicate that the USTs were 2,500 and 5,000-gallon diesel tanks. A letter dated April 1, 1991 form the Port indicate that the USTs were 5,000-gallons each and were used to store gasoline and diesel fuel, respectively.	USTs	USTs 104 and 105 were removed in 1988. USTs and 4 were removed in 1990.	CAM 17 Metals, TPH-gas, TPH-diesel, TPH-motor oil, BTEX, and MTBE	In 2000, surface soil samples were collected and analyzed for VOCs, and metals. Only arsenic was detected above action level. USTs 3 and 4 soil samples from the excavation had the following maximum concentrations: TPH-gasoline at 710 ppm, TPH-diesel at 5,600 ppm, and BTEX at 2,690 ppm. Maximum groundeaer concentrations reported TPH-gasoline at 2,700 ppb, TPH-diesel at 1,600,000 ppb, and BTEX at 152 ppb. USTs 104 and 105 in soil within the excavation had TPHs (specific hydrocarbon not defined) to 600 ppm and oil and grease up to 46,020 ppm. No concentrations of TPHs, oil and grease or BTX were detected in the grab groundwater sample. TPH-gas (12 ppm), TPH-diesel (2,600 ppm), TPH-motor oil (2,700 ppm) and trace concentrations of BTX were in soil at the detected capillary fringe immediately outside of former excavation in 1997. Grab groundwater sample contained TPH-gas (430 ppb) and TPH-diesel (41,000 ppb).	USTs 104 and 105 were removed in January 1988 with elevated concentrations of petroleum hydrocarbons and oil and grease in soil and groundwater from samples collected from within the excavation area. UST excavation was backfilled with excavated material. Port and SFDPH LOP records indicate that USTs 3 and 4 were owned by Convoy Company and installed in 1956. Soil and groundwater samples collected in the UST removal excavations contained concentrations of TPH-gasoline, TPH-diesel and BTEX. Excavated soil was placed back in the excavations. Petroleum odors were noted during UST removal. Arsenic detected in soil was above the Industrial PRG July 2000. Arsenic PRG is lower than the estimated background level based on literature values.	Detected concentrations of toluene, ethylbenzene and xylenes in USTs 104 and 105 soil were below USEPA PRGs using the industrial land use scenarios. TPH-diesel in groundwater adjacent to the former UST area require additional assessment or remediation. For USTs 3 and 4, a letter from the Port to SFDPH dated April 1, 1991 stated that because both USTs were within the right-of-way of a "current Clean Water Program modifying the combined sanitary sewer and stormwater drain system along Mariposa and 20th Street," the soil would be reexcavated during construction of the planned new sewer line and disposed off-site.	Pier 70 Mixed Use Opportunity Area, SF, CA, Phase II Brownfields Target Site Assessment Report, Ecology and Environment, Inc, November 2000. Site History Report and Work Plan City Tow Pier 70 San Francisco, CA, Iris Environmental, February 7, 2002. Subsurface Investigation for Port of San Francisco, Pier 70 San Francisco, CA, Tetra Tech, December 1997.

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Parcel 4	Buildings 114 and 115	Machine Ship and Foundary	Historical Site Operation	TPHs, PAHs, VOCs, and CAM 17 Metals	None Performed	No information	- -	Pier 70 Maritime Use Area Phase I Brownfields Environmental Site Assessment Report, Ecology and Environment, March 2001.
Parcel 5	Small rectangular portion of City Tow used for storage of impounded vehicles outside area east of Building 2. (2002) Vehicle crushing operations area formerly utilized by Pick Your Part (Building 31). Located within a steel frame warehouse building open on three sides. Numerous areas of stained surface soil within the triangular portion of Area A of the Pick your Part facility (2000).	Machine Shop Car Crushing City Tow Lot	A site visit in early 2002 identified dark hydrocarbon-like staining throughout the the small rectangular area on the ground surface. The asphalt surface of the site was observed to be in poor condition. Port of San Francisco identified the triangular area as a concern due to visible surface staining as described in a letter dated April 26, 2000. Elevated concentrations of TPHs and lead were detected in a stockpile sample. No confirmation samples were collected following soil removal. City and County of San Francisco Department of Parking and Traffic requested Pick Your Part to asses the presence of asbestos in pipe lagging within an exposed utility trench within the triangular area in 2000.	TPH, BTEX, VOCs, and CAM 17 Metals, VOCs, SVOCs, and asbestos	Shallow soil samples (up to 3 feet bgs) were collected from 5 boring locations within the small rectangular area and analyzed for Article 22 compliance. TPH-motor oil at the ground surface was detected at a concentration of 5,800 ppm and Benzo(a)pyrene at 0.3 ppm. According to the report, the remaining levels of chemicals were below relevant, conservative, screening-level regulatory thresholds specified by the USEPA Region IX residential PRGs and/or in RWQCB industrial and commercial RBSLs. Stockpile sample results from the triangular area indicated TPH as diesel at 810 ppm and TPH as motor oil at 3,200 ppm. TPH as gasoline was ND. Lead at 7,100 ppm. TCLP for lead at 1.2 mg/L. Lead above TTLC hazardous criteria. Other CAM 17 metals do not appear to be of concern. Type and percent of asbestos was not identified from material surrounding pipes in utility trench within the triangular area.	Mitigation of the area around the high TPH-motor oil and benzo(a)pyrene concentrations was proposed in the 2002 report for the small rectangular area. Surface soil remediation was performed in September 2000 within the triangular area. Areas of remediation were identified as having surface staining consistant with hydrocarbon or other automotive fluid stains. Remediation involved the removal of surface soil from areas ranging in size from a few inches to 25 feet by 3 feet by 1-foot deep. Remediation was complete when no visible staining was observed following soil removal. No confirmation samples were collected at remediated areas. 20 cubic yards of soil was removed and transported off-site as indicated in the 2000 report. Approximately 150 to 200 linear feet of pipeline were remediated between March and April 2001 within the triangular area. Portions of the pipeline that were buried beneath inaccessible (paved) portions of the site were not remediated. Soil impacted by TPH and BTEX was removed from an area 24 x 24 feet by the building where car crushing took place. Six-foot deep confirmatio samples indicated impacted soil was removed.	Iris stated that the levels of chemicals observed in the soils within the small rectangular area are below relevant, conservative, screening-level regulatory thresholds specified by USEPA Region IX in residential PRGs and/or in RWQCB industrial and commercial RSBLs, with the exception of TPH-motor oil and benzo(a)pyrene. The triangular area was paved over with new asphalt in November 2000 following soil remediation activities. Vertical delineation of contaminants was not performed during the 2004 investigation within the vehicle crushing area. No groundwater samples were collected. There is no mention of remediation of areas where	Soils Analysis Report and Mitigation Plan City Tow Pier 70 San Francisco, CA, Iris Environmental (Iris), July 10, 2002. Soil Remediation Report Pick Your Part, Inc. Pier 70, San Francisco, CA, Iris, December 12, 2000. Asbestos Abatement Report Pick Your Part, Inc. Pier 70, San Francisco, CA, Iris, December 12, 2000. Site Investigation Report Former Crusher Building Pick Your Part, Inc. Pier 70, San Francisco, CA, Iris, July 13, 2004. Supplemental Investigation Report Former Crusher Building Former City Tow-Pier 70, San Francisco, CA, Iris, March 3, 2005. Certification Report Pick Your Part, Inc. Pier 70 San Francisco, CA. Iris, 19 August 2005.

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Parcel 5 (Continued)	Utility Trench within triangular portion of Area A of the Pick Your Part facility.		In May 2004, the Port requested a limited investigation of soils underlying concrete joints and cracks within the vehicle crushing building. Area as having numerous soil stains and degraded ground surface. The Port requested a supplemental investigation within the vehicle crushing area be performed to evaluate the lateral and vertical extent of TPH-gasoline and BTEX in soil and groundwater based on the results of the 2004 investigation conducted by Iris. The Port requested the investigation in a letter dated August 12, 2004.		In June 2004 10 shallow subsurface soil samples (0.5 to 1.0 foot) were collected from beneath the concrete slab of the vehicle crushing building. Eight of the locations were preferentially located along cracks and joints in the concrete floor. Maximum concentrations included TPH-gasoline at 3,600 ppm, TPH-diesel at 3,600 ppm, TPH-motor oil at 5,400 ppm, benzene at 7.7 ppm, toulene at 100 ppm, ethylbenzene at 47 ppm, and xylenes at 69 ppm. In January 2005, twelve soil borings were advanced through the concrete floor in the southern and northern portions of the vehicle crushing building. Twenty nine soil samples and six groundwater samples were submiited for analysis. Maximum concentrations in soil included TPH-gasoline at 4,800 ppm, benzene at 11 ppm, toulene at 89 ppm, ethylbenzene at 65 ppm, and xylenes at 310 ppm. In general, concentrations of TPH-gasoline and BTEX were shown to decrease with depths at essentially 15 feet bgs. Groundwater samples were ND for TPH-gasoline from the samples collected in the southern portion of the building and was detected at a maximum concentration of 4.7 mg/L in the northern portion of the building.	Iris concluded that a limited remediation of soil was warranted in the vicinity of boring IE-7 in the vehicle crushing area where elevated concentrations of TPH-gasoline and BTEX was detected. Iris stated that minor soil remediation to 1-foot bgs may be warranted in the southern portion of the vehicle crushing building and limited remediation of soil to 6-feet bgs may be warranted in the northern portion of the building. Mitigation of the area around the high TPH-motor oil and benzo(a)pyrene concentrations was proposed in the 2002 report for the small rectangular area. Surface soil remediation was performed in September 2000 within the triangular area. Areas of remediation were identified as having surface staining consistant with hydrocarbon or other automotive fluid stains. Remediation involved the removal of surface soil from areas ranging in size from a few inches to 25 feet by 3 feet by 1-foot deep. Remediation was complete when no visible staining was observed following soil removal. No confirmation samples were collected at remediaited areas. 20 cubic yards of soil was removed and transported off-site as indicated in the 2000 report.	TPH-motor oil exceeded the comparable ESLs (shallow soil /non -drinking water resource for commercial/industrial site use) at 6 of the 10 locations. Iris stated that the detections of TPH-gasoline and BTEX in groundwater samples in the northern portion of the vehicle crushing building may be attributed to the percolation of perched shallow water from the impacted shallow soils entering the well points.	
					samples indicated impacted soil was removed.	Approximately 150 to 200 linear feet of pipeline were remediated between March and April 2001 within the triangular area. Portions of the pipeline that were buried beneath inaccessible (paved) portions of the site were not remediated. Iris concluded that a limited remediation of soil was warranted in the vicinity of boring IE-7 in the vehicle crushing area where elevated concentrations of TPH-gasoline and BTEX was detected. Iris stated that minor soil remediation to 1-foot bgs may be warranted in the southern portion of the vehicle crushing building and limited remediation of soil to 6-feet bgs may be warranted in the northern portion of the building.		
Parcels 5 and 6	Building 12 and surrounding area	Plating Shop Welding areas Metal fabrication, boiler room Machine shop	Historical land use in the immediate area north, northeast, and east included a dense area of industrial ship building support operations. These structures included a machine shop, areas of welding platen, sheet metal fabrication and power stations including a substation (Building 21) and a small boiler room on the north side of former Slip No. 5.	TPHs, PCBs, and CAM 17 Metals	None Performed	No information	- -	City of San Francisco Historical maps of Pier 70 dated 1959.

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Parcels 6, and 8. Parcels 9 and Slipways Park	Disposal Sites (Fill Material). Two distinct areas were filled in the 1970s and differ in fill characteristics. One formed by the filling of of four former shipyard slips using approximately 17,000 cubic yards of demolition debris from previously existing structures on the site, mixed with excavated earth material and the second located immediately to the north of the filled shipyard slips was cut and filled to the existing grade, with the southwestern portion cut to bedrock, and fill obtained primarily from Irish Hill. Groundwater at Pier 70 Waste Disposal Sites. Open space along the south eastern shoreline within the area of former slips.	Demolition debris disposal Metal Fabrication Shop	The Port of San Francisco contracted with GRC and The Mark Group in 1988, to achieve compliance with California RWQCB Order No. 87-060, which specified waste discharge requirements for the inactive disposal site at Pier 70. Subsequent investigations indicated that soil metals exceeded TTLC thresholds for hazardous waste and that some metals and SVOC soil are present at concentrations that exceed regulatory criteria. Site investigation by GRC in 1989 indicated the presence of metals, VOCs, and SVOCs in soil which could impact groundwater. Groundwater monitoring at four well locations and surface water sampling at two locations was initiated in 1989.	Chemicals tested included metals, acids, SVOCs, pesticides, and VOCs. Ten soil borings were advanced across the sites. Two of the ten borings were located in the former slips ways and the others were located in areas adjacent to the former shipyard slips. Four of the ten borings were converted into groundwater monitoring wells (GW-1 through GW-4). In addition, the GRC 1989 report shows the location of up to 14 additional boring locations advanced during a 1986 investigation. Groundwater and surface water sampling was initiated in the fourth quarter of 1989. Monitoring had shown a consistent absence of detectable volatile and semivolatile organic compounds. The monitoring program was reduced beginning in 1999.	Elevated concentrations of antimony, arsenic, cadmium, cobalt, and mercury were detected in soil from Boring B-1 at 4.5 feet. High levels of lead "scattered over the entire site". Mercury was detected in soil over the entire site. Nickel was reported at an elevated concentration in the area of Boring GW2. Thallium levels were reported to exceed the natural background level across the entire site. The report stated that mercury and selenium were found almost ubiquitously throughout the fill at relatively consistent concentrations whereas concentrations of copper, nickel and lead were highly variable. Eleven PAH compounds were detected in soil samples from boring B2 with ten of the compounds detected above 1,000 ppm. Phthalates were the only COC detected in groundwater samples. According to the report, total extratable petroleum hydrocarbons were not detected in surface water samples during 1999. TPH-diesel was detected in some of the wells at Pier 70 at a maximum concentration of 130 ppb. Total metals including chromium (0.0068 mg/L), lead (0.02 mg/L), mercury (0.0015 mg/L), and zinc (0.70 mg/L) were detect groundwater samples during the 1999 sampling events.	none completed	The report stated that vertical and lateral extent of COCs should be investigated around Borings B1 and B2 and that groundwater monitoring should be implemented to monitor the trend of phthalates over time. Two borings designated 1 and 2 located west of Building 6 (Shipyard Repair) were advanced in 1986 by GRC . Boring logs indicated an "oily sand" and a "sweet smell" in soil samples collected from these borings. In July 1999, the San Francisco Bay Regional Water Quality Control Board agreed to allow the Port to cease monitoring at Pier 70. Through Order No. 00-030, the RWQCB rescinded Order No. 87-060 in April 2000, stating that the waste discharge requirements were no longer appropriate for the disposal sites. The report recommended the wells at Pier 70 should be properly abandoned.	Data Compilation Report & Appendices A through D Data Logs Volume 1 of 3 Subchapter 15 Compliance Pier 70 Solid Waste Disposal Site San Francisco, CA, Geo/Resources Consultants, Inc. December 1989 and Amended Report of Waste Discharge Pier 70 Solid Waste Disposal Site Port of San Francisco, CA, The Mark Group, August 20, 1990. 1999 Annual Groundwater Monitoring Report for Piers 70 and 94 Port of San Francisco, CA, Tetra Tech, February 2000.
Parcel 6	Seawall Lot #349	Metal Fabrication Shop Bay Infilling	No site-specific data regarding the on-site presence of contaminants were identified during the Phase I ESA conducted in October 2003.	Metals and PAHs	No site-specific data for this site. However, the site is located within the area of historical Bay infilling. COC are identified based on the GRC 1989 investigation and are inferred to be located on the Seawall Lot 349 due to the historic fill material.	none completed		Phase I Environmental Site Assessment One-Acre parcel on Seawall Lot #349 Eastern Termination of Twentieth Street Pier 70 Port of San Francisco San Francisco, CA, Iris. October 23, 2003.
Parcel 8 and Slipways Park	Former Potrero Power Plant located immediately south of the Pier 70.	Powerplant Plating Welding Shipyard Support Area	Numerous environmental investigations and evaluations of potential human and ecological risks have been conducted on the Power Plant property and documental in various reports beginning in 1990. COCs identified on the site were also identified immediately to the north on Pier 70 property.	Previous investigations indicate that COCs in soil and groundwater are primarily associated with former industrial operations and placement of fill material. These chemicals include metals, PAHs, volatile organic compounds (primarily BTEX), TPH, cyanide, pesticides, PCBs, and phenols. Manufactured Gas Plant (MGP) waste is present at depths generally greater than 10 feet below ground surface. Environmental impacts within the northeastern shoreline are primarily associated with the presence of MGP waste within the fill material overlying the Bay Mud.	Core samples collected on the Port property north of the Potrero Power Plant site were observed to contain continuous and discontinuous MGP waste ranging in thickness from 1.5 to 6 feet. The discontinuous and continuous MGP waste was observed in fill directly above the Bay Mud.	Remedial alternatives are currently being developed for the Power Plant site.	Additional investigations are required to delineate lateral and vertical extent of MGP waste.	Report of Results-Shoreline Investigation Potrero Power Plant Site 1201 Illinois Street San Francisco, CA, AMEC Geomatrix, March 2008.

Table 2
Historical Site Information Summary
Pier 70 Environmental Site Investigation
San Francisco, California

Pier 70 Master Plan Reuse Area	Source Area Location	Source Area's)	Source Area Determination Rationale	Potential Contaminants of Concerns	Chemical Analyses Information	Remediation	Remarks	Document Title
Parcel 9, BAE Ship Repair	Building 109 and former Galvanizing area and Iron Yard located to the west and south west of Building 109. Eastern Expansion, Southeast corner of the Mixed Use Opportunity Area, including Buildings 109, 36, and 104.	Paintshops, Hydraulic press Galvanizing areas, Foundary Metal fabrication Plating/Welding	Historical past uses include iron and steel construction, platering shop, galvanizing, metal foundary, ironyard, storage area for old machinery parts, paint shop, and metal fabrication.	Metals, VOCs, TPH-gas, TPH-diesel, TPH-motor oil, BTEX, MTBE, and asbestos.	Surface soil samples collected north and west of Building 109 in July 2000 showed elevated levels of PAHs, iron, lead, chromium, and arsenic. VOCs and asbestos were not detected above Industrial PRGs. Subsurface soil samples collected to the west showed elevated concentrations of PAHs, iron, lead, chromium, and arsenic. VOCs, TPH and asbestos were not detected above Industrial PRGs. Surface soil samples collected in July 2003 south of Building 109 detected concentrations of PAHs, arsenic, lead and asbestos above Industrial PRGs. TPH-motor oil was detected above the ESL. VOCs were not detected above the Industrial PRGs. Groundwater samples collected to the west showed that total concentrations (not dissolved concentrations) of 10 metals were above USEPA PRG-Industrial criteria. VOCs and PAHs not detected.	None	Arsenic levels are relatively high in fill. Mean and estimated average concentrations of arsenic in this area are within this established background range.	Phase I ESA for Pier 70, Mixed Use Opportunity Area, corner of Illinois St and 20th St, SF CA 94107, Volume I of II,Tetra Tech, August 1998. Pier 70 Mixed Use Opportunity Area Phase II Brownfields Targeted Site Assessment Report, Ecology and Environment, Inc. November 2000. Pier 70 Mixed Use Opportunity Area Expanded Phase II Targeted Brownfields Assessment Report, Ecology and Environment, Inc. January 2004. 1900, 1914, and 1950 Sanborn Maps (Appendix A)
Parcel 9, BAE Ship Repair	Building 6	Hazardous Waste Storage	55-gallon drums of solid waste, 2 drums of asbestos, and between 100 to 200 55-gallon drums of chlorinated solvents, PCB-laden waste, and caustic waste were illegally stored at Building 6. Many of the drums reportedly leaked.	PCBs, dioxins, metals, and VOCs	No specific concentrations were reported.	Clean up of this area included excavation of the affected soil and high pressure cleaning of the building surfaces.		Pier 70 Maritime Use Area Phase I Brownfields Environmental Site Assessment Report, Ecology and Environment, March 2001.
Parcel 9, BAE Ship Repair	4,170 barrel fuel oil tank located southeast of Building 111.	USTs/ASTs	Sanborn map dated 1914 indicates a 4,170 barrel AST located southeast of current Building 111. The AST is enclosed within a brick wall.	TPH-diesel and TPH-motor oil	No information	No information	- -	Sanborn Maps (Appendix A)
Parcel 9, BAE Ship Repair	Power House Building 38	Powerhouse	Sanborn map dated 1914 indicates a power house occupying the eastern portion of current Building 38. This building is located immediately west of Building 111. The Fuel oil AST described above may have provided fuel for the power house. Boilers appear to be located within the Powerhouse structure.	TPH, PCBs, and CAM 17 Metals	No information	No information	- -	Sanborn Maps (Appendix A)
Parcel 9, BAE Ship Repair	Building 105	Metal Fabrication and Powerhouse	Historical Site Operation	TPH, PCBs, and CAM 17 Metals	None Performed	No information	- -	Pier 70 Maritime Use Area Phase I Brownfields Environmental Site Assessment Report, Ecology and Environment, March 2001
Parcel 9, BAE Ship Repair	Boiler and Sandblasting Area between Piers 3 and 4	Powerhouse and Sand Blasting	Historical Site Operation	TPH, PCBs, and CAM 17 Metals	None Performed	No information	- -	Pier 70 Maritime Use Area Phase I Brownfields Environmental Site Assessment Report, Ecology and Environment, March 2001
Parcel 9, BAE Ship Repair	Building 145 (Also known as Building 103)	Powerhouse	Two non-operational boilers	TPH, PCBs, and CAM 17 Metals	None Performed	No information	- -	Pier 70 Maritime Use Area Phase I Brownfields Environmental Site Assessment Report, Ecology and Environment, March 2001
Parcel 9, BAE Ship Repair	Building 19	Potential Hazardous Waste Storage (former garage)	Historical Site Operation	TPH, PCBs, and CAM 17 Metals	None Performed	No information	- -	City of San Francisco Historical map of Pier 70 dated 1959.

Table 2
Historical Site Information Summary
Pier 70 Environmental Site Investigation
San Francisco, California

Pier 70 Master Plan Reuse Area	Source Area Location	Source Area's)	Source Area Determination Rationale	Potential Contaminants of Concerns	Chemical Analyses Information	Remediation	Remarks	Document Title
Parcel 9, BAE Ship Repair	Building 106 and smaller building east of Substation #7.	Painters Buildings	Historical Site Operation.	VOCs	None Performed	No information	- -	City of San Francisco Historical map of Pier 70 dated 1959.
Parcel 9, BAE Ship Repair	Substation #s 4, 6, and 7 between Piers 4 and 5.	Powerhouse	Historic Site Operation	PCBs	None Performed	No information	- -	City of San Francisco Historical maps of Pier 70 dated 1959.

Notes:
ASTs - aboveground storage tanks
BTEX - benzene, toluene, ethylbenzene, and xylenes
COCs - Contaminants of Concerns\
ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency Screening for environmental concerns at Sites with contamination in soil and groundwater Table B - Groundwater and Soil for Residential and Commerical Land Use.
mg/L - micrograms per liter
MTBE - methyl tert butyl ether
PAHs - polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
ppb - parts per billion
ppm - parts per million
PRG - Preliminary Remediation Goal
ROA - Remedial Action Objective
RWQCB - Regional Water Quality Control Board
SFDPH LOP - San Francisco Department of Public Health Local Oversight Program
SVOCs - Semi volatile organic compounds
TDS - total dissolved solids
TPHd - Total Petroleum Hydrocarbons as Diesel Range
TPHg - Total Petroleum Hydrocarbons as Gasoline
TPHmo - Total Petroleum Hydrocarbons as Motor Oil
TTLC - Total Threshold Limited Concentration
USEPA - United States Environmental Protection Agency
USTs - Underground storage tanks
VOCs - Volatile Organic Compounds

Table 3
Phase 1 Sampling and Analysis Plan
Pier 70 Environmental Site Investigation
San Francisco, California

	Potential Source Area	Master Plan Reuse Area	Location No.	Potential Soil or Soil Gas Sample Depths (feet bgs)[1]	Soil Borings	Soil Gas Borings	Drilling Depth (feet bgs)	Soil Samples Analyzed	Grab Groundwater Samples	Soil Gas Samples	TPHg (C_7-C_{12}) EPA 8015M		TPHd (C_{12}-C_{24}) EPA 8015M		TPHmo (C_{24}-C_{36}) EPA 8015M		PAHs EPA 8270 SIM		LUFT 5 [4] Metals EPA Method 6010/ 6020		CAM 17 [4] EPA 6010/ 6020		VOCs EPA 8260B		BTEX and MTBE EPA 8260		PCBs EPA 8082		Cyanides EPA 9010C		Asbestos PLM		pH EPA Method 150.1		Dioxins and Furans EPA 8290	Sulfide EPA 9030B		Pesticides [3] 8081	OnSite Lab VOCs EPA 8260B	OnSite Lab Methane 8015M	OffSite Lab[2] VOCs EPA Method TO-15	OffSite Lab[2] Methane SCAQMD 25.1M	Geotech Parameters
											Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	Soil	GW	Soil	Soil Gas	Soil Gas	Soil Gas	Soil Gas	
Parcel 1	Bay Fill	Commercial and Residential	P1SB-01	5,10,20,30	1		30	3	1		3	1	3	1	3	1	3	1			3	1	3	1			3		3	1	3		3	1		3	1						2
	Bay Fill		P1SB-02	2,5,10	1		10	2			2		2		2		2		2												2							1					
	UST/AST		P1SB-03	2,5,10	1		10	2			2		2		2		2		2						2						2												
	Hazardous Waste Storage		P1SB-04	2,5,10	1		10	2			2		2		2		2				2		2				2																
	Bay Fill		P1SG-01	TBD		1	10			1													1																1	1			
	Bay Fill		P1SG-02	TBD		1	10			1													1																1	1			
Crane Cove Park	Bay Fill	Open Space	CCSB-01	2, 5,10	1		10	2			2		2		2		2		2												2												
	Bay Fill		CCSB-02	2,5,10	1		10	2			2		2		2		2		2																								
	Filled Slipways		CCSB-03	5, 10, 20, 30	1		30	3	1		3	1	3	1	3	1	3	1	1	1	3	1	3	1			3		3	1	3		3	1		3	1						2
	Filled Slipways		CCSG-01	5		1	6			1																													1	1			
	Bay Fill		CCSG-02	5		1	6			1																													1	1			
	Filled Slipways		CCSG-03	5		1	6			1																													1	1			
Parcel 2	Bay Fill	Commercial	P2SB-01	2, 5,10	1		10	2			2		2		2		2		2																								
	UST/AST		P2SB-02				10		1			1		1		1		1		1						1																	
	Paint Shop, Galvanizing, Metal Fabrication, Foundry, Plating		P2SB-03	2, 5,10	1		10	2			2		2		2		2				2		2				2																
	Powerhouse		P2SB-04				10		1			1		1		1		1		1								1															
	Bay Fill		P2SB-05	2, 5,10	1		10	2			2		2		2		2		2																								
	Bay Fill		P2SB-06	5,10,20,30	1		30	3	1		3	1	3	1	3	1	3	1			3	1	3	1			3		3	1	3		3	1		3	1						2
	Bay Fill		P2SG-01	TBD		1	10			1																													1	1			
	Bay Fill		P2SG-02	TBD		1	10			1																													1	1			
	Paint Shop, Galvanizing, Metal Fabrication, Foundry, Plating		P2SG-03 and P2SG-04	Subslab		2	10			2																													2	2			
Parcel 3	Bay Fill Hazardous Waste Storage	Commercial and Residential	P3SB-01	2,5,10	1		10	2			2		2		2		2				2																						
	Bay Fill Hazardous Waste Storage		P3SB-02	5,10,20,30	1		30	3	1		3	1	3	1	3	1	3	1			3	1	3	1			3	1	3	1	3		3	1		3	1						2
	Bay Fill		P3SG-01	TBD		1	10			1																													1	1	1	1	
Parcel 4	Hazardous Waste Storage Machine Shop	Commercial	P4SB-01	2,5,10	1		10	2			2		2		2		2				2		2				2																
	Hazardous Waste Storage Machine Shop		P4SB-02	2,5,10	1		10	2			2		2		2		2				2		2				2																
	Bay Fill		P4SB-03	2,5,10	1		10	2			2		2		2		2		2												2												
	Bay Fill		P4SB-04	2,5,10	1		10	2			2		2		2		2		2																								
	Machine Shop Foundary		P4SB-05	2,5,10	1		10	2			2		2		2		2				2		2				2																
	Hazardous Waste Storage Machine Shop		P4SB-06	2,5,10	1		10	2			2		2		2		2				2		2				2																
	Hazardous Waste Storage Powerhouse		P4SB-07	2,5,10	1		10	2			2		2		2		2				2		2				2								2			1					
	Hazardous Waste Storage		P4SB-08	2,5,10	1		10	2			2		2		2		2				2		2				2																
	Bay Fill		P4SB-09	2,5,10	1		10	2			2		2		2		2		2																								
	UST/AST		P4SB-10	2,5,10	1		10	2			2		2		2				2						2																		
	UST/AST		P4SB-11	2,5,10	1				1		2	1	2	1	2	1	2	1	2	1					2	1																	
	Bay Fill		P4SG-01	TBD		1	10			1																													1				
	Powerhouse		P4SG-02	Subslab		1	10			1																													1	1			
	Machine Shop Foundary		P4SG-03	Subslab		1	10			1																													1	1			
	Machine Shop Foundary		P4SG-04	Subslab		1	10			1																													1	1			
	Hazardous Waste Storage Machine Shop		P4SG-05	TBD		1	10			1																													1	1			
	UST/AST		P4SG-06	TBD		1	10			1																													1	1			
	Machine Shop Foundary		P4SG-07	Subslab		1	10			1																													1	1			
	UST/AST		P4SG-08	Subslab		1	10			1																													1	1	1	1	
Parcel 5	Bay Fill	Commercial	P5SB-01	5,10,20,30	1		30	3	1		3	1	3	1	3	1	3	1			3	1	3	1			3		3	1	3		3	1		3	1						2
	Machine Shop/Autowrecking		P5SB-02	2,5,10	1		10	2			2		2		2		2				2		2				2																
	Machine Shop/Autowrecking		P5SB-03	2,5,10	1		10	2			2		2		2		2				2		2				2											1					
	Bay Fill		P5SB-04	2,5,10	1		10	2			2		2		2		2		2																								
	Machine Shop Plating Welding		P5SB-05	2,5,10	1		10	2			2		2		2		2				2		2				2																
	Machine Shop/Autowrecking		P5SG-01	TBD		1	10			1																													1	1			
	Machine Shop/Autowrecking		P5SG-02	Subslab		1	10			1																													1	1			
	Machine Shop Plating Welding		P5SG-03	Subslab		1	10			1																													1	1			
	Machine Shop/ Auto wrecking		P5SG-04	Subslab		1	10			1																													1	1			

Table 3
Phase 1 Sampling and Analysis Plan
Pier 70 Environmental Site Investigation
San Francisco, California

	Potential Source Area	Master Plan Reuse Area	Location No.	Potential Soil or Soil Gas Sample Depths (feet bgs)[1]	Soil Borings	Soil Gas Borings	Drilling Depth (feet bgs)	Soil Samples Analyzed	Grab Groundwater Samples	Soil Gas Samples	TPHg (C_7-C_{12}) EPA 8015M		TPHd (C_{12}-C_{24}) EPA 8015M		TPHmo (C_{24}-C_{36}) EPA 8015M		PAHs EPA 8270 SIM		LUFT 5 [4] Metals EPA Method 6010/ 6020		CAM 17 [4] EPA 6010/ 6020		VOCs EPA 8260B		BTEX and MTBE EPA 8260		PCBs EPA 8082		Cyanides EPA 9010C		Asbestos PLM		pH EPA Method 150.1		Dioxins and Furans EPA 8290	Sulfide EPA 9030B		Pesticides [3] 8081	OnSite Lab VOCs EPA 8260B	OnSite Lab Methane 8015M	OffSite Lab[2] VOCs EPA Method TO-15	OffSite Lab[2] Methane SCAQMD 25.1M	Geotech Parameters
											Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	GW	Soil	Soil	GW	Soil	Soil Gas	Soil Gas	Soil Gas	Soil Gas	
Parcel 6	Bay Fill	Commercial	P6SB-01	5,10,20,30	1		30	3	1		3	1	3	1	3	1	3	1			3	1	3	1			3		3	1	3		3	1		3	1						2
	Plating Welding Metal Fabrication		P6SB-02	2,5,10	1		10	2	1		2	1	2	1	2	1	2	1			2	1	2	1			2	1															
	Plating Welding Metal Fabrication		P6SB-03	2,5,10	1		10	2			2		2		2		2				2		2				2																
	Bay Fill		P6SB-04	2,5,10	1		10	2			2		2		2		2		2																								
	Bay Fill		P6SB-05	2,5,10	1		10	2			2		2		2		2		2																								
	Bay Fill		P6SB-06	2,5,10	1		10	2			2		2		2		2		2																			1					
	Filled Slipways		P6SB-07	2,5,10	1		10	2			2		2		2		2		2																								
	Hazardous Waste Storage		P6SB-08	2,5,10	1		10	2			2		2		2		2				2		2				2																
	Bay Fill		P6SG-01	TBD		1	10			1																													1	1			
	Bay Fill		P6SG-02	TBD		1	10			1																													1	1			
	Bay Fill		P6SG-03	TBD		1	10			1																													1	1			
	Bay Fill		P6SG-04	TBD		1	10			1																													1	1			
	Bay Fill		P6SGP-01[2]	TBD		1	10			1																															4	4	
	Bay Fill		P6SGP-02[2]	TBD		1	10			1																															4	4	
Parcel 7	Bay Fill	Commercial	P7SB-01	2,5,10	1		10	2			2		2		2		2		2																								
	Machine Shop AutoWrecking		P7SB-02	2,5,10	1		10	2			2		2		2		2				2		2																				
Parcel 8	UST/AST	Commercial	P8SB-01	5,10,20,30	1		30	3	1		3	1	3	1	3	1	3	1	3	1			3	1			3		3	1	3		3	1		3	1						2
	UST/AST		P8SG-01	TBD		1	10			1																													1	1			
Slipways Park	Bay Fill	Open Space	SPSB-01	2,5,10	1		10	2			2		2		2		2		2																								
	Bay Fill		SPSB-02	2,5,10	1		10	2			2		2		2		2		2																								
	Bay Fill		SPSB-03	2,5,10	1		10	2			2		2		2		2		2																								
	Bay Fill		SPSB-04	5,10,20,30	1		30	3	1		3	1	3	1	3	1	3	1			3	1	3	1			3		3	1	3		3	1		3	1						2
	Plating Welding DNAPL		SPSB-05	2,5,10	1		10	2			2		2		2		2				2		2				2																
	Bay Fill		SPSGP-01[2]							1																															4	4	
	Bay Fill		SPSGP-02[2]							1																															4	4	
	Bay Fill		SPSGP-03[2]							1																															4	4	
	Bay Fill		SPSGP-04[2]							1																															4	4	
	Demolition Debris		SPTP-01	3, 10				2			2		2		2		2				2																						
	Demolition Debris		SPTP-02	3, 10				2			2		2		2		2				2																						
	Demolition Debris		SPTP-03	3, 10				2			2		2		2		2				2																						
	Demolition Debris		SPTP-04	3, 10				2			2		2		2		2				2																						
	Demolition Debris		SPTP-05	Concrete Core																																							
Central Plaza Park	UST/AST		CPSB-01	2,5,10	1		10	2	1		2	1	2	1	2	1	2	1	2	1					2	1																	
	Bay Fill		CPSB-02	2,5,10	1		10	2			2		2		2		2		2																								
	Bay Fill		CPSB-03	5,10,20,30	1		30	3	1		3	1	3	1	3	1	3	1			3	1	3	1			3		3	1	3		3	1		3	1						2
Parcel 9	Paint Shop, Galvanizing, Metal Fabrication, Foundry, Plating	BAE Ship Repair	P9SB-01	2, 5,10	1		10	2			2		2		2		2				2		2				2																
	Paint Shop, Galvanizing, Metal Fabrication, Foundry, Plating		P9SB-02	2, 5,10	1		10	2			2		2		2		2				2		2				2																
	Powerhouse		P9SB-03	2, 5,10	1		10	2	1		2	1	2	1	2	1	2	1	2	1							2	1															
	Bay Fill		P9SB-04	5,10,20,30	1		30	3	1		3	1	3	1	3	1	3	1			3	1	3	1			3		3	1	3		3	1		3	1						2
	Hazardous Waste Storage		P9SB-05	2, 5,10	1		10	2			2		2		2		2				2		2				2											1					
	Bay Fill		P9SB-06	5,10,20,30	1		30	3	1		3	1	3	1	3	1	3	1			3	1	3	1			3		3	1	3		3	1		3	1						2
	Bay Fill		P9SG-01	TBD		1				1																													1	1			
	Bay Fill		P9SG-02	TBD		1				1																													1	1			
	Bay Fill		P9SG-03	TBD		1				1																													1	1			
	Bay Fill		P9SG-04	TBD		1				1																													1	1	1	1	
				Total	**54**	**33**	**1038**	**125**	**17**	**37**	**127**	**17**	**127**	**17**	**127**	**17**	**125**	**17**	**50**	**7**	**78**	**11**	**73**	**12**	**8**	**3**	**71**	**4**	**33**	**11**	**41**	**0**	**33**	**11**	**2**	**33**	**11**	**5**	**31**	**30**	**27**	**27**	**22**

Notes

[1] Sample depths are approximate. Actual sample depths submitted for analyses will be based on visible soil staining, discoloration, PID screening results, odors, and/or changes in lithology. Soil gas sample depths for locations outside of existing buildings to be determined (TBD) following groundwater monitoring well installation and groundwater level measurement. Soil gas samples collected at locations inside exisitng building were collected below the building foundation concrete slab within subslab soil.

[2] Soil gas probes sampled quarterly for one year and analyzed by Calscience Laboratories for Methane using ASTM D-1946 and VOCs using EPA Method TO-15 if warrranted by analytical results

[3] The upper soil sample (2 foot) will be analyzed for organochlorine pesticides by EPA Method 8081.

bgs - below ground surface

BTEX - benzene, toluene, ethylbenzene and xylenes

Geotechnical Parameters - particle size by ASTM Method D-422, total organic carbon (TOC) by Walkley Black Method, porosity by ASTM Method D-2974, permeability by ASTM Method 2434, or ASTM 5084, bulk density, and moisture content by ASTM Method 2937, Atterberg Limits by ASTM D4318.

LUFT 5 Metals - cadmium (Cd), chromium (Cr), lead (Pb), nickel (Ni), and zinc (Zn)

[4] Approximately 35% of the total metals samples were analyzed using California Waste Extraction Test and/or 20% of the total metals samples were analyzed using Toxicity Characteristic Leachate procedure.

MTBE - methyl tert-butyl ether

PAHs - polycyclic aromatic hydrocarbons

PCBs - polychlorinated biphenols

PLM - polarized light microscopy

SB - Soil Boring

SG - Soil Gas

SGP - Soil Gas Probe

TP - Test Pit

TPHd - Total Petroleum Hydrocarbons as diesel (C12-C24), EPA Method 8015M

TPHg - Total Petroleum Hydrocarbons as gasoline (C7-C12), EPA Method 8015M

TPHfo - total petroleum hydrocarbons as fuel oil using a motor oil (C24-C36), Method 8015M

SCAQMD - Southern California Air Quality Management District

VOCs - volatile organic compounds

Duplicate samples were collected at a rate of 10% for soil gas and groundwater samples.

Soil gas duplicate samples were analyzed by an off-site laboratory for VOCs using EPA method TO-15 and methane using SCAQMD 25.1M.

Table 4
Phase 2 Sampling and Analysis Plan
Pier 70 Environmental Site Investigation
San Francisco, California

	Potential Source Area	Master Plan Reuse Area	Location	Potential Soil or Soil Gas Sample Depths (feet bgs)[1]	Shallow Soil Borings	Soil Borings	Soil Gas Borings	Drilling Depth (feet bgs)	Monitoring Well [2]	Soil Samples Analyzed	Grab Groundwater Samples[3]	Soil Gas Samples	Soil Gas Probe Sample	TPHg (C_7-C_{12}) EPA 8015M		TPHd (C_{12}-C_{24}) EPA 8015M		TPHmo (C_{24}-C_{36}) EPA 8015M		PAHs EPA 8270 SIM		SVOCs EPA 8270C-SIM	CAM 17	LUFT 5 plus As, Co, Cu, Hg, EPA Method 6010/ 6020[4]		(Cr^{6+})[5]		VOCs EPA 8260B		Dioxins and Furans EPA 8290	OffSite Lab[6] VOCs EPA Method TO-15 and Methane SCAQMD 25.1M	Fuel Fingerprints	Fluid Properties	Soil Physical Properties**	Rationale
														Soil	GW	Soil	GW	Soil	GW	Soil	GW		Soil	Soil	GW	Soil	GW	Soil	GW	Soil	Soil Gas	NAPL		Soil	
Parcel 1	Bay Fill	Commercial and Residential	P1SG-03	4			1	6				1																			1				Delineate extent of PCE and methane in soil gas
	Bay Fill		P1SG-04	4			1	6				1																			1				Delineate extent of PCE and methane in soil gas
Crane Cove Park	Bay Fill	Open Space	CCSB-04	1.5, 10, 15		1		15		2	1			2	1	2	1	2	1	2	1			2		1									Investigate TPH between CCMW-01 and the Bay
	Bay Fill		CCSB-05	1.5, 2, 10, 15		1		15		2				2		2		2		2				2		1									Investigate potential TPH migration to Bay
	Bay Fill		CCSS-06	1.5	1			1.5		1										1				1											Collect additional shallow soil data needed for construction worker risk assessment
	Bay Fill		CCSS-07	1.5, 2	1			1.5		1										1				1		1									Collect additional shallow soil data needed for for construction worker risk assessment
	Filled Slipways		CCTP-01	2				8		1										1		1		1											Investigate construction of historical slips
	Filled Slipways		CCTP-02																																Investigate construction of historical slips
	Filled Slipways		CCTP-03	7				8		1				1		1		1		1		1		1											Investigate construction of historical slips
	Filled Slipways		CCTP-04																																Investigate construction of historical slips
	Bay Fill		CCMW-01						1						1		1		1		1				1		1								Further characterize groundwater
	Filled Slipways		GWDG3						1						1		1		1		1				1		1								Further characterize groundwater
	Filled Slipways		GWDG4						1																		1								Further characterize groundwater
Parcel 2	Bay Fill	Commercial	P2SB-07	1.5, 7.5, 15		1		15		2				2		2		2		2				2											Delineate TPH, PAH ESL exceedance at P2SB-01
	Bay Fill		P2SB-08	1.5, 7.5, 8, 15		1		15		3				2		2		2		2				2		1									Delineate TPH, PAH ESL exceedance at P2SB-01
	Bay Fill		P2SB-09	1.5, 7.5, 15		1		15		2				2		2		2		2				2											Delineate TPH, PAH ESL exceedance at P2SB-01
	Plating and Welding		P2SB-10	1.5, 7.5, 15		1		15		2	1			2	1	2	1	2	1	2	1			2				2	1						Investigate whether GW is a source for benzene in soil gas
	Plating and Welding		P2SG-05	4			1	10				1																			1				Delineate benzene ESL exceedance and methane in soil gas
	Plating and Welding		P2SG-06	4			1	10				1																			1				Delineate benzene ESL exceedance and methane in soil gas
	Bay Fill		P2MW-01						1						1		1		1		1				1		1								Further characterize groundwater
Parcel 3	Bay Fill	Residential	P3MW-01						1						1		1		1		1				1		1								Further characterize groundwater
Parcel 4	Hazardous Waste Storage	Commercial	P4SB-12	1.5, 7.5, 15		1		15		2	1			1	1	1	1	1	1	1	1			1		1			1						Delineate TPH and PAH impacts in soil and groundwater
	Hazardous Waste Storage		P4SB-13	1.5, 5		1		5		2										1				1						2					Dileneate dioxin furans in shallow soil
	Hazardous Waste Storage		P4SB-14	1.5, 5		1		5		2										1				1						2					Dileneate dioxin furans in shallow soil
	Hazardous Waste Storage		P4SB-15	1.5, 5		1		5		2										1				1						2					Dileneate dioxin furans in shallow soil
	Hazardous Waste Storage /Machine Shop		P4SB-16	1.5, 5, 10		1		10		2				2		2		2		2				2											Delineate TPH and PAH impacts to soil
	Machine Shop		P4SG-09	8			1	10				1																			1				Confirm presence of 1,1,1 TCA in soil gas
Parcel 5	Machine Shop/Autowrecking	Commercial	P5SS-06	1.5, 2	1			1.5		1										1				1		1									Collect additional shallow soil data needed for construction worker risk assessment
	Machine Shop/Autowrecking		P5SS-07	1.5	1			1.5		1										1				1											Collect additional shallow soil data needed for construction worker risk assessment
	Machine Shop/Autowrecking		P5SS-08	1.5	1			1.5		1										1				1											Collect additional shallow soil data needed for construction worker risk assessment

Table 4
Phase 2 Sampling and Analysis Plan
Pier 70 Environmental Site Investigation
San Francisco, California

	Potential Source Area	Master Plan Reuse Area	Location	Potential Soil or Soil Gas Sample Depths (feet bgs)^1	Shallow Soil Borings	Soil Borings	Soil Gas Borings	Drilling Depth (feet bgs)	Monitoring Well ^{2}	Soil Samples Analyzed	Grab Groundwater Samples^3	Soil Gas Samples	Soil Gas Probe Sample	TPHg (C_7-C_{12}) EPA 8015M		TPHd (C_{12}-C_{24}) EPA 8015M		TPHmo (C_{24}-C_{36}) EPA 8015M		PAHs EPA 8270 SIM		SVOCs EPA 8270C-SIM	CAM 17	LUFT 5 plus As, Co, Cu, Hg, EPA Method 6010/ 6020^4		(Cr^{6+})^5		VOCs EPA 8260B		Dioxins and Furans EPA 8290	OffSite Lab^6 VOCs EPA Method TO-15 and Methane SCAQMD 25.1M	Fuel Fingerprints	Fluid Properties	Soil Physical Properties**	Rationale
														Soil	GW	Soil	GW	Soil	GW	Soil	GW		Soil	Soil	GW	Soil	GW	Soil	GW	Soil	Soil Gas	NAPL		Soil	
Parcel 6	Filled Slipways	Commercial	P6SB-09	1.5, 5		1		10		2				2		2		2		2				2											Investigate configuration of Slipways
	Filled Slipways		P6SB-10	1.5, 5		1		10		2				2		2		2		2				2											Investigate configuration of Slipways
	Filled Slipways		P6SS-11	1.5	1	1		1.5		1										1				1											Collect additional shallow soil data needed for construction worker risk assessment
	Bay Fill		P6SGP-01										1																		1				Collect 2nd Quarter Soil Gas Samples
	Filled Slipways		P6SGP-02										1																		1				Collect 2nd Quarter Soil Gas Samples
Parcel 8	Filled Slipways	Commercial	P8SB-02	1.5, 2, 5		1		10		2				2		2		2		2				2		1									Investigate configuration of Slipways
	Filled Slipways		P8MW-01						1						1		1		1		1				1		1								Further characterize groundwater
	DNAPL		P8SG-02	5			1	7																							1				Investigate potential impacts to soil gas
	DNAPL		P8SG-03	5			1	7																							1				Investigate potential impacts to soil gas
	DNAPL		TGU-18	1.5, 10, 12		1		12		3				1		1		1		3			3												Collected from PG&E investigation borings
	DNAPL		TMW-28A						1						1		1		1		1				1		1		1						Further characterize groundwater
Central Plaza Park	UST/AST	BAE Ship Repair	CPSB-04	1.5, 7.5, 15		1		15		2	1			2	1	2	1	2	1	2	1			2											Investigate former UST area at Building 113
	UST/AST		CPMW-01						1						1		1		1		1				1		1								Further characterize groundwater
Parcel 9	Bay Fill		P9SB-04*	15, 16.5, 18, 19.5		1		19.5		2																						1	1	2	Characterize and delineate NAPL
	Bay Fill		P9SB-06*	12, 14		1		14		2																						1	1	2	Characterize and delineate NAPL
	UST/AST		P9SB-07	1.5, 7.5, 15		1		20		2	1			2	1	2	1	2	1	2	1			2											Delineate free phase TPH in soil
	UST/AST		P9SB-08	1.5, 7.5, 15		1		20		2				2		2		2		2				2											Delineate free phase TPH in soil and groundwater
	Bay Fill		P9SB-09A	1.5, 7.5, 15		1		15		2	1			2	1	2	1	2	1	2	1			2											Assess contaminant migration into Bay
	Power House		P9SB-09B	1.5, 7.5, 15		1		15		2	1			2	1	2	1	2	1	2	1			2											Assess contaminant migration into Bay
	Metal Fabrication		P9SB-10	1.5, 7.5, 14.5, 15		1		20		2	1			2	1	2	1	2	1	2	1			2		1						1		2	Delineate free phase TPH in soil and groundwater, and characterize and delineate NAPL
	Metal Fabrication		P9SB-11	7.5, 15, 17		1		17		3	1			2	1	2	1	2	1	2	1			2		1		1							Characterize and delineate NAPL
	UST/AST		P9SB-12	7.5, 15, 17		1		20		3	1			2	1	2	1	2	1	2	1			2											Characterize and delineate NAPL
	UST/AST		P9SB-13	7.5, 15, 20		1		20		2	1			2	1	2	1	2	1	2	1			2											Characterize and delineate NAPL
	UST/AST		P9SB-14	4.5, 10.5		1		10.5		2				1		1		1		2															Characterize and delineate NAPL
	Metal Fabrication		P9SG-05	8			1	10				1																			1				Delineate benzene, 1,1,1- TCA, toluene, ethylbenzenes, and xylenes in soil gas
	Metal Fabrication		P9SG-06	8			1	10				1																			1				Delineate benzene, 1,1,1- TCA, toluene, ethylbenzenes, and xylenes in soil gas
	UST/AST		P9MW-01						1						1		1		1		1				1		1		1						Further characterize groundwater
	Metal Fabrication/Substation		P9MW-02						1						1		1		1		1				1		1		1						Further characterize groundwater
	Power House		P9MW-03						1						1		1		1		1				1		1		1						Further characterize groundwater
	UST/AST		P9MW-04						1						1		1		1		1				1		1		1						Further characterize groundwater

Table 4
Phase 2 Sampling and Analysis Plan
Pier 70 Environmental Site Investigation
San Francisco, California

	Potential Source Area	Master Plan Reuse Area	Location	Potential Soil or Soil Gas Sample Depths (feet bgs)[1]	Shallow Soil Borings	Soil Borings	Soil Gas Borings	Drilling Depth (feet bgs)	Monitoring Well [2]	Soil Samples Analyzed	Grab Groundwater Samples[3]	Soil Gas Samples	Soil Gas Probe Sample	TPHg (C_7-C_{12}) EPA 8015M		TPHd (C_{12}-C_{24}) EPA 8015M		TPHmo (C_{24}-C_{36}) EPA 8015M		PAHs EPA 8270 SIM		SVOCs EPA 8270C-SIM	CAM 17	LUFT 5 plus As, Co, Cu, Hg, EPA Method 6010/ 6020[4]		(Cr^{6+})[5]		VOCs EPA 8260B		Dioxins and Furans EPA 8290	OffSite Lab[6] VOCs EPA Method TO-15 and Methane SCAQMD 25.1M	Fuel Fingerprints	Fluid Properties	Soil Physical Properties**	Rationale
														Soil	GW	Soil	GW	Soil	GW	Soil	GW		Soil	Soil	GW	Soil	GW	Soil	GW	Soil	Soil Gas	NAPL		Soil	
Slipways Park	Bay Fill	Open Space	SPSS-05	2, 2.5	1			1.5		1										1				1		1									Collect additional shallow soil data needed for construction worker risk assessment
	Filled Slipways		SPSS-06	1.5	1			1.5		1										1				1											Collect additional shallow soil data needed for construction worker risk assessment
	Filled Slipways		SPSS-07	1.5	1			1.5		1										1				1											Collect additional shallow soil data needed for construction worker risk assessment
	Filled Slipways		SPSS-08	1.5	1			1.5		1										1				1											Collect additional shallow soil data needed for construction worker risk assessment
	Filled Slipways		TGU-16	1, 10, 14.5, 20		1		20		4				4		4		4		4			4					1							Collected from PG&E investigation borings
	Filled Slipways		TGU-23	1.5, 9.5, 13.5		1		13.5		3				2		2		2		3			3												Collected from PG&E investigation borings
	Filled Slipways		TGU-24	1.5	1			1.5		1										1			1												Collected from PG&E investigation borings
	Filled Slipways		SPMW-01						1						1		1		1		1				1		1		1						Further characterize groundwater
	Bay Fill		SPSGP-01										1																		1				Collect 2nd quarter soil gas samples
	Bay Fill		SPSGP-02										1																		1				Collect 2nd quarter soil gas samples
	Bay Fill		SPSGP-03										1																		1				Collect 2nd quarter soil gas samples
	Bay Fill		SPSGP-04										1																		1				Collect 2nd quarter soil gas samples
				Total	**11**	**30**	**9**	**520**	**13**	**78**	**11**	**7**	**6**	**48**	**23**	**48**	**23**	**48**	**23**	**67**	**23**	**2**	**11**	**54**	**12**	**10**	**13**	**4**	**8**	**6**	**15**	**3**	**2**	**6**	

Notes

[1] Sample depths are approximate. Actual sample depths submitted for analyses will be based on visible soil staining, discoloration, PID screening results, odors, and/or changes in lithology.

[2] Monitoring Well (MW) SAP were determined following Phase 2 soil and grab groundwater data review.

[3] Grab groundwater samples were collected if observations in the field indicate the presence of free phase hydrocarbons in soil or groundwater.

[4] Approximately 35% of the total metals samples were analyzed using California Waste Extraction Test and/or 20% of the total metals samples were analyzed using Toxicity Characteristic Leachate procedure.

[5] Cr^{6+} Hexavalent chromium samples will be chosen following review of the total chromium data. Approximately 25% of the samples with the highest total chromium detections were analyzed for Cr^{6+}

[6] Soil gas probes sampled quarterly for one year and analyzed by Calscience Laboratories for Methane using ASTM D-1946 and VOCs using EPA Method TO-15 if warrranted by analytical results.

bgs - below ground surface
DNAPL - Dense non-aqueous phase liquids
NAPL - non-aqueous phase liquids consisting of highly degraded petroleum phydrocarbons
LUFT 5 Metals - cadmium (Cd), chromium (Cr), lead (Pb), nickel (Ni), and zinc (Zn)
PAHs - polycyclic aromatic hydrocarbons
PCE - tetrachloroethene
PID - Photo Ionization Detector
SB - Soil Boring SG - Soil Gas TP - Test Pit
SGP - Soil Gas Probe SS - Shallow surface soil
TPHd - Total Petroleum Hydrocarbons as diesel (C12-C24), EPA Method 8015M
TPHg - Total Petroleum Hydrocarbons as gasoline (C7-C12), EPA Method 8015M
TPHfo - total petroleum hydrocarbons as fuel oil using a motor oil (C24-C36), Method 8015M
VOCs - volatile organic compounds
SCAQMD - Southern California Air Quality Management District
Duplicate samples were collected at a rate of 10% for soil gas and groundwater samples.
* Phase 1 location resampled for NAPL analysis and characterization.
**Soil Physical Properties include Grain Size analysis by method ASTM D422, Pore Fluid Saturation measurements including moisture content, bulk and grain density, total and air filled porosity, and water and NAPL pore fluid saturations by method API RP 40, and Hydraulic Conductivy by method API RP 40; EPA 9100.

Table 5
Geotechnical Testing Results
Pier 70 Environmental Site Investigation
San Francisco, California

				Moisture Content	Dry Density	Void Ratio	Porosity (n)	Particle size analysis ASTMD-44				Permeability	Specific Gravity	Atterberg Limits ASTM D-4313 LL	PI	% <No.200 Sieve
Location ID	Start Depth	End Depth	Sample Date	%	lbs/ft^3	vol void/ vol solid	%	% Gravel	% Sand	% Silt	% Clay	cm/s	@ 20°C			
CCSB-03	10	10.5	08/27/09	54.5	65.2	1.46	59.4	0	8.7	51.1	40.2	2.11 e-08	2.68	NA	NA	91.3
	25.5	30	08/28/09	72.9	56.2	1.7	63	0	1.3	49.8	48.9	5.92E-08	2.45	NA	NA	98.7
P2SB-06	9.5	10	09/08/09	16.3	107.4	0.52	34	19	63	14.1	3.9	8.88E-06	2.43	NA	NA	18
P3SB-02	21	21.5	08/28/09	21.2	111.4	0.53	34.7	22	49	16.7	12.3	5.42E-08	2.76	NA	NA	29
P6SB-01	19.5	20	09/09/09	48.7	71.6	1.42	58.6	0	27	41	32	3.55E-08	2.55	56	33	73
	24.5	25	09/09/09	57.4	61.8	1.37	57.9	0	7.3	48.3	44.4	3.41E-08	2.35	NA	NA	92.7
P8SB-01	6	6.5	08/31/09	21.2	111.4	0.49	32.9	18	58	15	9	3.65E-08	2.64	NA	NA	24
	9.5	10	08/31/09	11.7	117.9	0.35	25.9	40	47	6.6	6.4	NA	2.55	NA	NA	13
P9SB-04	5.5	6	09/09/09	5.2	132.4	0.17	14.8	48	37	10	5	NA	2.49	NA	NA	15
P9SB-06	10.5	11	08/27/09	8.7	133.2	0.29	22.7	34	51	11.4	3.6	NA	2.76	26	9	15
	19.5	20	08/27/09	58.1	66	1.55	60.7	0	2.9	54.6	42.5	3.60E-08	2.67	NA	NA	97.1
SPSB-04	9.5	10	08/31/09	12.2	126.2	0.33	24.8	59	28	7.7	5.3	NA	2.69	42	23	13
	24.5	25	08/31/09	45.5	75.9	1.21	54.8	0	22.6	40.9	36.5	3.62E-08	2.61	NA	NA	77.4

Notes:
NA - not analyzed
lbs/ft^3 - pounds per cubic foot
% - percent
PI - plasticity index
cm/s - centimeter per second

Table 6
Groundwater Elevations and Well Construction Details
Pier 70 Site Investigation
San Francisco, CA

Well ID	Installation Date	Measurement Date	Casing Diameter	Depth to Bottom of Casing	Depth to Top of Screen	Depth to Bottom of Screen	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Tide Cycle[1]
			inches	feet bgs	feet bgs	feet bgs	feet msl	feet bgs	feet msl	rising/ falling/high/low
CCMW-01	08/27/09	10/06/09	2	20.0	5.0	20.0	11.12	4.75	6.37	falling
		12/01/09						3.90	7.22	rising
		03/19/10						2.35	8.77	falling
SPMW-01	08/31/09	10/06/09	2	15.0	5.0	15.0	11.86	8.58	3.28	falling
		12/01/09						9.00	2.86	rising
		03/19/10						8.65	3.21	falling
CPMW-01	09/11/09	10/06/09	2	15.0	5.0	15.0	13.65	10.12	3.53	falling
		12/01/09						10.50	3.15	rising
		03/19/10						10.02	3.63	falling
P2MW-01	08/28/09	10/06/09	2	18.0	8.0	18.0	12.04	6.75	5.29	falling
		12/01/09						6.60	5.44	rising
		03/19/10						5.80	6.24	falling
P3MW-01	08/28/09	10/06/09	2	18.0	8.0	18.0	18.74	13.56	5.18	falling
		12/01/09						13.20	5.54	rising
		03/19/10						12.61	6.13	falling
P8MW-01	08/31/09	10/06/09	2	25.0	5.0	25.0	11.66	6.67	4.99	falling
		12/01/09						6.50	5.16	rising
		03/19/10						6.21	5.45	falling
P9MW-01	08/27/09	10/06/09	2	20.0	5.0	20.0	14.28	10.80	3.48	falling
		12/01/09						10.40	3.88	rising
		03/19/10						10.81	3.47	falling
P9MW-02	09/09/09	10/06/09	2	18.0	5.0	18.0	11.99	7.12	4.87	falling
		12/01/09						6.80	5.19	rising
		03/19/09						6.31	5.68	falling
P9MW-03	03/04/10	03/19/10	2	20.0	5.0	20.0	10.35	4.48	5.87	falling
P9MW-04	03/05/10	03/19/10	2	20.0	5.0	20.0	14.72	10.77	3.95	falling
GWDG3	10/21/04	03/19/10	2	8.5	4.5	8.5	9.70	4.94	4.76	falling
GWDG4	10/21/04	03/19/10	2	7.5	3.5	7.5	9.80	3.86	5.94	falling
TMW-28A	10/18/02	03/18/10	2	25.0	15.1	24.0	11.81	9.22	2.59	falling

Notes
feet bgs - feet below ground surface
feet msl - feet above mean sea level
Top of Casing Elevations - Elevations are referrenced to 1988 North American Vertical Datum
1 - Tide data source is National Oceanic and Atmospheric Administration. Tide times were not directly available for Pier 70. Tide cycle data is based upon tidal charts for Crissy Field Station presented in Appendix G. The tide charts in Appendix G are time corrected for Pier 70 based upon evaluation of tide times for nearby Hunters Point and Pier 22 and comparison to tide times at Crissy Field Station. The correction assumes that Pier 70 is located halfway between Hunters Point and Pier 22, and that high/low tide at Pier 70 occurs at the median time between high/low tide at Hunters Point and Pier 22. The resultant estimated time difference between Pier 70 and Crissy Field is 30 minutes.

Groundwater Measurement Time Intervals - Measurements collected 10/06/09 between approximately 1315 and 1430 hours; Measurements collected 12/01/09 between approximately 1535 and 1450 hours; Measurements collected 03/19/09 between approximately 1200 and 1400 hours; Measurement collected at TMW-28A on 03/18/10 at approximately 1100 hours.

Table 7
TPH Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	TPHd	TPHg	TPHmo
			ESL Residential	100	100	370
			ESL Commercial	180	180	2,500
			Unit	mg/kg	mg/kg	mg/kg
Location ID	Start Depth (ft)	End Depth (ft)	Sample Date			
CCSB-01	5	5.5	09/02/09	**1.6 Y**	< 1.1	**4.6 J**
	9.5	10	09/02/09	**15 Y**	< 0.94	**29**
CCSB-02	1.5	2	09/02/09	**600 Y**	**0.30 J**	**1,900**
	9.5	10	09/02/09	**120 Y**	< 0.93	**93**
CCSB-03	9	9.5	08/27/09	**57 Y**	**4.1 Y**	**64**
	14.5	15	08/28/09	**39 Y**	< 0.95 J U	**46**
	28.5	29	08/28/09	**5.4 Y**	< 0.97	**13**
CCSB-04	1	1.5	12/14/09	**2.2 Y**	< 1.0 J U	**20**
	9.5	10	12/14/09	**1.9 Y**	< 0.93 J U	**6.9**
CCSB-05	1	1.5	12/14/09	**50 Y**	< 0.97 J U	**180**
	9.5	10	12/14/09	**5.7 Y**	< 0.97 J U	**18**
CCSS-06	1	1.5	12/14/09	**60 Y**	< 0.94 J U	**330**
CCSS-07	1	1.5	12/14/09	**52 Y**	< 1.1 J U	**230**
CPSB-01	4.5	5	09/11/09	**240 Y**	**0.098 J**	**220**
	9.5	10	09/11/09	**230 Y**	**0.081 J**	**250**
CPSB-02	4.5	5	09/11/09	**17 Y**	**0.090 J**	**25**
	9.5	10	09/11/09	**26 Y**	**0.076 J**	**81**
CPSB-03	6	6.5	08/31/09	**20 Y**	< 0.97 J U	**23**
	9	9.5	08/31/09	**29 Y**	**0.091 J**	**87**
	14	14.5	08/31/09	**1.2 Y**	**0.089 J**	**5.3**
CPSB-04A	1	1.5	12/08/09	**17 Y**	**0.063 J**	**66**
CPSB-04B	1	1.5	12/14/09	**100 Y**	**1.1 Y**	**360**
	9.5	10	12/14/09	**2,700 Y**	**17 Y**	**2,500**
P1SB-02	1.5	2	09/02/09	**6.4 Y**	< 1.0	**51**
	9.5	10	09/02/09	**0.36 J**	**0.091 J**	< 5.0
P1SB-03	5	5.5	09/02/09	**150**	**0.084 J**	**170**
	9.5	10	09/02/09	**1.1 Y**	< 1.1	**2.1 J**
P1SB-04	2	2.5	08/28/09	**41 Y**	**0.053 J**	**190**
	4.5	5	08/28/09	**4.2 Y**	**0.061 J**	**9.5**
P2SB-01	1.5	2	08/28/09	**410 Y**	< 0.97	**1,600**
	9.5	10	08/28/09	**690 Y**	**0.22 J**	**1,200**
P2SB-03	1.5	2	09/02/09	**33 Y**	**0.055 J**	**100**
	9.5	10	09/02/09	**79 Y**	**0.47 J**	**64**
P2SB-05	5	5.5	08/28/09	**15 Y**	**0.096 J**	**20**
	9.5	10	08/28/09	**0.36 J**	**0.050 J**	**1.1 J**

Table 7
TPH Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

Location ID	Start Depth (ft)	End Depth (ft)	Chemical Name	TPHd	TPHg	TPHmo
			ESL Residential	**100**	**100**	**370**
			ESL Commercial	**180**	**180**	**2,500**
			Unit	**mg/kg**	**mg/kg**	**mg/kg**
			Sample Date			
P2SB-06	5.5	6	09/08/09	**11 Y**	**0.10 J**	**30**
	9.5	10	09/08/09	**32 Y**	**0.074 J**	**95**
	19.5	20	09/08/09	**0.69 J**	**0.085 J**	**8.9**
P2SB-07	1	1.5	12/07/09	**46 Y**	**0.075 J**	**64**
	7	7.5	12/07/09	**280 Y**	**0.064 J**	**340**
P2SB-08	1	1.5	12/07/09	**86 Y**	**0.077 J**	**500**
	7	7.5	12/07/09	**43 Y**	**0.069 J**	**48**
P2SB-09	1	1.5	12/07/09	**68 Y**	**0.054 J**	**280**
	7	7.5	12/07/09	**70 Y**	**0.072 J**	**130**
P2SB-10	7	7.5	12/09/09	**29 Y**	**0.068 J**	**31**
P3SB-01	1.5	2	09/02/09	**8.9 Y**	**0.050 J**	**53**
	5	5.5	09/02/09	**18 Y**	**0.052 J**	**87**
P3SB-02	6	6.5	08/28/09	**75 Y**	**0.074 J**	**620**
	10	10.5	08/28/09	**20 Y**	**0.074 J**	**39**
	20	20.5	08/28/09	**1.3 Y**	**0.057 J**	**3.7 J**
P4SB-01	5	5.5	09/02/09	**15 Y**	**0.073 J**	**120**
	9.5	10	09/02/09	**3.7 Y**	< 0.97	**4.4 J**
P4SB-03	1.5	2	09/03/09	**1.4 Y**	**0.062 J**	**3.2 J**
	9.5	10	09/03/09	**0.26 J**	< 0.97	**1.2 J**
P4SB-04	5	5.5	09/03/09	**130 Y**	**0.076 J**	**250**
	9.5	10	09/03/09	**1.9 Y**	**0.062 J**	**4.6 J**
P4SB-05	1.5	2	09/03/09	**9.6 Y**	**0.058 J**	**18**
	9.5	10	09/03/09	**22 Y**	**0.17 J**	**13**
P4SB-06	1.5	2	09/03/09	**120 Y**	**0.075 J**	**930**
P4SB-07	1.5	2	09/03/09	**20 Y**	< 1.0 J U	**110**
	4.5	5	09/03/09	**38 Y**	**0.11 J**	**240**
P4SB-08	1.5	2	09/03/09	**35 Y**	**0.069 J**	**370**
	5	5.5	09/03/09	**0.37 J**	**0.066 J**	< 5.0
P4SB-09	1.5	2	09/08/09	**25**	**0.081 J**	**84**
	4	4.5	09/08/09	**50**	**0.091 J**	**32**
P4SB-10	1.5	2	09/08/09	**0.58 J**	**0.060 J**	**6.3**
	4.5	5	09/08/09	**0.32 J**	**0.071 J**	< 5.0
P4SB-11	4.5	5	09/11/09	**0.76 J**	**0.069 J**	**1.2 J**
	8.5	9	09/11/09	**0.53 J**	**0.067 J**	< 5.0

Table 7
TPH Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	**TPHd**	**TPHg**	**TPHmo**
			ESL Residential	**100**	**100**	**370**
			ESL Commercial	**180**	**180**	**2,500**
			Unit	**mg/kg**	**mg/kg**	**mg/kg**
Location ID	**Start Depth (ft)**	**End Depth (ft)**	**Sample Date**			
P4SB-12	1	1.5	12/16/09	**240 Y**	**0.18 J**	**600**
	12.5	13	12/16/09	**20 Y**	**0.059 J**	**12**
P4SB-13	1	1.5	12/16/09	**7.7 Y**	**33 Y**	**2.3 J**
P4SB-14	1	1.5	12/14/09	**85 Y**	< 1.0 J U	**460**
P4SB-15	1	1.5	12/14/09	**220 Y**	< 0.94 J U	**690**
P4SB-16	1	1.5	12/16/09	**280 Y**	**0.35 J**	**1,200**
	9.5	10	12/16/09	**1.0 Y**	**0.069 J**	**0.78 J**
P5SB-01	5	5.5	08/28/09	**32 Y**	**0.080 J**	**210**
P5SB-02	1.5	2	09/08/09	**4.9 Y**	**0.27 J**	**24**
	4.5	5	09/08/09	**0.73 J**	**0.089 J**	**1.8 J**
P5SB-03	1.5	2	09/10/09	**1,100 Y**	**0.13 J**	**790**
	4.5	5	09/10/09	**51 Y**	**0.084 J**	**22**
P5SB-04	1.5	2	09/10/09	**34 Y**	**0.090 J**	**200**
	4	4.5	09/10/09	**0.30 J**	**0.11 J**	< 5.0
P5SB-05	1.5	2	09/10/09	**0.14 J**	**0.093 Jb**	< 5.0
	4	4.5	09/10/09	**0.26 J**	**0.081 J**	< 5.0
P5SS-06	1	1.5	12/14/09	< 0.99 Y U	< 1.1 J U	**11**
P5SS-07	1	1.5	12/08/09	**53 Y**	**0.44 J**	**310**
P5SS-08	1	1.5	12/08/09	**14 Y**	< 1.0	**79**
P6SB-01	5.5	6	09/09/09	**56 Y**	< 0.98	**84**
	9.5	10	09/09/09	**30 Y**	**0.038 J**	**39**
	19.5	20	09/09/09	**11 Y**	**0.041 J**	**16**
P6SB-02	1.5	2	08/27/09	**57 Y**	**0.062 J**	**420**
	5	5.5	08/27/09	**75 Y**	**0.099 J**	**800**
P6SB-03	5	5.5	09/03/09	**28 Y**	**0.065 J**	**140**
	9.5	10	09/03/09	**990 Y**	**0.96 Y**	**1,300**
P6SB-05	1.5	2	09/11/09	**14**	**0.072 J**	**32**
	3.5	4	09/11/09	**0.71 J**	**0.072 J**	**2.0 J**
P6SB-06	1.5	2	09/09/09	**0.22 J**	**0.053 J**	< 5.0
	4.5	5	09/09/09	**3.0 Y**	< 1.0	**7.0**
P6SB-07	4.5	5	09/09/09	**21 Y**	**0.18 J**	**190**
	9.5	10	09/09/09	**0.41 J**	**0.11 J**	< 5.0
P6SB-08	1.5	2	09/09/09	**65 Y**	**0.20 J**	**310**
	4.5	5	09/09/09	**560 Y**	**17 Y**	**800**

Table 7
TPH Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	TPHd	TPHg	TPHmo
			ESL Residential	100	100	370
			ESL Commercial	180	180	2,500
			Unit	mg/kg	mg/kg	mg/kg
Location ID	Start Depth (ft)	End Depth (ft)	Sample Date			
P6SS-11	1	1.5	12/07/09	**55 Y**	**0.062 J**	**660**
P7SB-01	1.5	2	09/10/09	**1.5 Y**	**0.17 J**	**2.5 J**
	4.5	5	09/10/09	**0.63 J**	**0.072 J**	**0.86 J**
P7SB-02	4.5	5	09/10/09	**0.33 J**	**0.098 Jb**	< 5.0
	9.5	10	09/10/09	< 1.0	**0.10 Jb**	< 5.0
P8SB-01	5	5.5	08/31/09	< 1.0 J U	< 1.0 J U	< 5.0
	8.5	9	08/31/09	< 1.0 J U	< 1.0 J U	**0.77 J**
	18.5	19	08/31/09	< 0.99 J U	< 0.99 J U	< 5.0
P8SB-02	1	1.5	12/08/09	**200 Y**	**0.073 J**	**220**
	4.5	5	12/08/09	**2,400 Y**	**16**	**1,200**
P9SB-01	4.5	5	09/09/09	**0.66 J**	< 1.0	**3.1 J**
	10.5	11	09/09/09	**660 Y**	**0.088 J**	**1,200**
P9SB-02	6.5	7	08/28/09	**24 Y**	**0.059 J**	**22**
	9.5	10	08/28/09	**24 Y**	**0.053 J**	**69**
P9SB-04	5.5	6	09/09/09	**49 Y**	**0.045 J**	**130**
	14.5	15	09/09/09	**1,300**	**2.0 Y**	**850**
	29.5	30	09/09/09	**5.9 Y**	**0.063 J**	**6.1**
P9SB-05	6	6.5	08/26/09	**99 Y**	**0.072 J**	**210**
	9.5	10	08/26/09	**71 Y**	**3.0 Y**	**66**
P9SB-06	5	5.5	08/27/09	**33 J**	< 0.97 J U	**1,100**
	14.5	15	08/27/09	**1,600 Y**	**75 Y**	**1,300**
	24.5	25	08/27/09	**7.8 Y**	< 1.0 J U	**22**
P9SB-07	1	1.5	12/10/09	**64 Y**	**0.19 J**	**350**
	14.5	15	12/10/09	**7,900**	**20 Y**	**6,500**
	19.5	20	12/10/09	**83**	**0.095 J**	**110**
P9SB-08	1	1.5	12/10/09	**60 Y**	**0.28 J**	**270**
	14.5	15	12/10/09	**670**	**7.5 Y**	**560**
	19.5	20	12/10/09	**98**	**0.16 J**	**190**
P9SB-09A	1	1.5	12/10/09	**750 Y**	**0.35 J**	**950**
	7	7.5	12/10/09	**8,800**	**35 Y**	**1,800**
	14.5	15	12/10/09	**330**	**2.5 Y**	**170**
P9SB-09B	7	7.5	12/09/09	**14 Y**	**0.069 J**	**25**
P9SB-10	14.5	15	12/09/09	**120**	**26 Y**	**96**
	19.5	20	12/09/09	**53**	**1.2 Y**	**35**

Table 7
TPH Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	**TPHd**	**TPHg**	**TPHmo**
			ESL Residential	**100**	**100**	**370**
			ESL Commercial	**180**	**180**	**2,500**
			Unit	**mg/kg**	**mg/kg**	**mg/kg**
Location ID	**Start Depth (ft)**	**End Depth (ft)**	**Sample Date**			
P9SB-11	7	7.5	12/17/09	**18 Y**	**0.062 J**	**11**
	14.5	15	12/17/09	**1,200 Y**	**82 Y**	**860**
P9SB-12	7	7.5	12/17/09	**8.8 Y**	**0.064 J**	**50**
	14.5	15	12/17/09	**5,300 Y**	**140 Y**	**2,200**
P9SB-13	7	7.5	12/17/09	**58 Y**	**0.057 J**	**180**
	14.5	15	12/17/09	**6,800 Y**	**140 Y**	**4,700**
P9SB-14	10	10.5	02/16/10	**1.9**	**0.084**	**6.0**
SPSB-01	5	5.5	08/27/09	**5.9 Y**	**0.070 J**	**47**
	9.5	10	08/27/09	**0.24 J**	**0.089 J**	< 5.0
SPSB-02	2.5	3	08/27/09	**110 Y**	**0.15 J**	**920**
	5.5	6	08/27/09	**3.6 Y**	**0.071 J**	**29**
SPSB-03	5	5.5	09/08/09	**0.58 J**	**0.075 J**	**0.90 J**
	9.5	10	09/08/09	**1.4 Y**	**0.061 J**	**5.3**
SPSB-04	5.5	6	08/31/09	**130 Y**	< 1.0 J U	**210**
	14.5	15	08/31/09	< 1.0 JY U	< 0.96 J U	**0.60 J**
	24.5	25	08/31/09	**5.5 Y**	< 1.0 J U	**15**
SPSB-05	4.5	5	09/10/09	**57 Y**	**0.11 Jb**	**56**
	9.5	10	09/10/09	**3,400 Y**	**1.7 Y**	**3,500**
SPSS-05	1.5	2	12/17/09	**28 Y**	**0.077 J**	**41**
SPSS-06	1	1.5	12/07/09	**83 Y**	**0.068 J**	**650**
SPSS-07	1	1.5	12/08/09	**65 Y**	**0.56 J**	**430**
SPSS-08	1.5	2	12/08/09	**87 Y**	**0.40 J**	**620**
SPTP-01	4.5	5	08/27/09	**89 Y**	**0.054 J**	**500**
	5.5	6	08/27/09	**120 Y**	**0.093 J**	**590**
SPTP-02	3.5	3.5	08/28/09	**48 Y**	< 0.99	**250**
SPTP-03	4	4	08/28/09	**33 Y**	**0.051 J**	**240**
	5.5	5.5	08/28/09	**98 Y**	**0.052 J**	**900**
SPTP-04	3	3	08/31/09	**120 Y**	**0.075 J**	**920**
	7	7	08/31/09	**170 Y**	**0.057 J**	**1,200**
SPTP-06	3.5	3.5	08/31/09	**17 Y**	**0.087 J**	**130**
	7	7	08/31/09	**64 Y**	**0.072 J**	**260**
TGU-16	0.5	1	11/17/09	**120 Y**	**0.076 J**	**590**
	9.5	10	11/17/09	**3,000 Y**	**9.1 Y**	**2,400**
	14	14.5	11/17/09	**160 Y**	**0.61 J**	**160**
	19.5	20	11/17/09	**260 Y**	**11**	**92**

Table 7
TPH Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

Location ID	Start Depth (ft)	End Depth (ft)	Chemical Name	TPHd	TPHg	TPHmo
			ESL Residential	**100**	**100**	**370**
			ESL Commercial	**180**	**180**	**2,500**
			Unit	**mg/kg**	**mg/kg**	**mg/kg**
			Sample Date			
TGU-18	9.5	10	11/22/09	**38 Y**	**4.3**	**120**
TGU-23	9	9.5	11/20/09	**9,200 Y**	**110**	**4,400**
	13	13.5	11/20/09	**26,000 Y**	**15**	**12,000**

Notes:

All results are reported in miligram per kilogram (mg/kg).

ft - feet

bgs - below ground surface

TPHg - Total Petroleum Hydrocarbons as Gasoline Range (C7-C12), EPA Method 8015M

TPHd - Total Petroleum Hydrocarbons as Diesel Range (C10-C24), EPA Method 8015M

TPHmo - Total Petroleum Hydrocarbons as Motor Oil (C24-C36), EPA Method 8015M

gray shading indicates result exceeds residential ESL

blue shading indicates result exceeds both residential and commercial ESLs

bold - indicates that detection above laboratory limits

ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency, Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008, Table B - Groundwater and Soil for Residential and Commerical Land Use.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.

Y - Sample exhibits a fuel pattern, which does not resemble standard.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Jb - The analyte was identified below the laboratory reporting limit but above the laboratory method detection limit and QAPP-specified reporting limit.

Table 8
PAH Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	Acenaphthene	Acenaphthylene	Anthracene	Benzo (a) anthracene	Benzo (a) pyrene	Benzo (b) fluoranthene	Benzo (g,h,i) perylene	Benzo (k) fluoranthene	Chrysene	Dibenzo(a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-cd) pyrene	Naphthalene	Phenanthrene	Pyrene
			ESL Residential	19	13	2.8	0.38	0.038	0.38	27	0.38	23	0.062	40	8.9	0.62	1.3	11	85
			ESL Commercial	19	13	2.8	1.3	0.13	1.3	27	1.3	23	0.21	40	8.9	2.1	2.8	11	85
			Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Location ID	Start Depth (ft)	End Depth (ft)	Sample Date																
CCSB-01	5	5.5	09/02/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.0011 J	0.001 J	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.0012 J
	9.5	10	09/02/09	0.0031 J	0.011	0.021	0.11	0.13	0.15	0.038	0.046	0.11	0.013	0.1	0.0069 J	0.039	0.009 J	0.025	0.32
CCSB-02	1.5	2	09/02/09	< 0.25	< 0.25	0.065 J	0.18 J	0.18 J	0.29	0.11 J	< 0.25	0.36	< 0.049*	0.33	< 0.25	0.069 J	0.14 J	0.5	0.44
	9.5	10	09/02/09	0.0078	< 0.0049	0.017	0.0068	0.0043 J	0.0036 J	0.002 J	< 0.0049	0.0064	< 0.0049	0.013	0.014	0.0016 J	0.0078	0.033	0.018
CCSB-03	9	9.5	08/27/09	0.016	0.0079 J	0.022	0.044	0.046	0.059	0.023	0.02	0.053	0.0069 J	0.077	0.03	0.021	0.007 J	0.092	0.11
	14.5	15	08/28/09	0.015	0.0087 J	0.03	0.079	0.089	0.098	0.041	0.03	0.083	0.015	0.12	0.025	0.04	0.01	0.099	0.17
	28.5	29	08/28/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.002 J	< 0.005
CCSB-04	1	1.5	12/14/09	< 0.0049	< 0.0049	< 0.0049	< 0.0049	0.0011 J	0.0018 J	0.0015 J	< 0.0049	0.0015 J	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049
	9.5	10	12/14/09	< 0.005	< 0.005	< 0.005	0.0024 J	0.0041 J	0.0054	0.0042 J	0.002 J	0.003 J	< 0.005	0.0039 J	< 0.005	0.0031 J	0.0015 J	0.0024 J	0.005
CCSB-05	1	1.5	12/14/09	0.033	0.039	0.1	0.35	0.42	0.58	0.29	0.17	0.38	0.087	0.58	0.029	0.27	0.024 J	0.36	0.64
	9.5	10	12/14/09	< 0.005	0.0043 J	0.0073	0.043	0.046	0.05	0.024	0.014	0.04	0.0069	0.053	0.0027 J	0.023	0.0021 J	0.014	0.086
CCSS-06	1	1.5	12/14/09	< 0.25	< 0.25	0.063 J	0.31	0.45	0.58	0.4	0.18 J	0.38	0.098 J	0.44	< 0.25	0.28	< 0.25	0.24 J	0.56
CCSS-07	1	1.5	12/14/09	0.037 J	0.063	0.072	0.36	0.42	0.55	0.27	0.17	0.39	0.071	0.62	0.023 J	0.25	0.013 J	0.25	0.77
CPSB-01	4.5	5	09/11/09	< 0.005	< 0.005	0.033	0.11	0.09	0.17	0.026	0.032	0.21	0.019	0.079	0.0074	0.021	0.085	0.26	0.11
	9.5	10	09/11/09	0.049	0.44	0.74	1.7	3.1	3.3	0.8	0.77	1.9	0.3	3.4	0.3	0.83	0.32	2.9	4.2
CPSB-02	4.5	5	09/11/09	0.0024 J	0.029	0.027	0.15	0.17	0.21	0.081	0.067	0.19	0.03	0.17	0.0055	0.086	0.015	0.13	0.2
	9.5	10	09/11/09	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
CPSB-03	6	6.5	08/31/09	0.0088	0.021	0.039	0.14	0.13	0.17	0.12	0.053	0.17	0.037	0.19	0.015	0.11	0.017	0.18	0.24
	9	9.5	08/31/09	< 0.005	0.0025 J	0.0022 J	0.012	0.016	0.022	0.019	0.0057	0.018	0.0058	0.014	< 0.005	0.014	0.0025 J	0.016	0.018
	14	14.5	08/31/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
CPSB-04A	1	1.5	12/08/09	0.027 J	0.021 J	0.065	0.17	0.23	0.27	0.19	0.082	0.2	0.054	0.3	0.048 J	0.19	0.014 J	0.26	0.33
CPSB-04B	1	1.5	12/14/09	< 0.025	< 0.025	0.0086 J	0.02 J	0.02 J	0.04	0.018 J	0.0084 J	0.038	< 0.025	0.029	0.011 J	0.011 J	0.0059 J	0.035	0.042
	9.5	10	12/14/09	0.51	< 0.25	< 0.25	0.45	0.39	0.65	0.24 J	0.14 J	1.1	< 0.05*	0.67	0.23 J	0.22 J	0.14 J	0.25	0.85
P1SB-02	1.5	2	09/02/09	< 0.025	0.0078 J	< 0.025	0.017 J	0.025 J	0.028	0.026	0.011 J	0.031	0.0063 J	0.022 J	< 0.025	0.014 J	0.0068 J	0.015 J	0.038
	9.5	10	09/02/09	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049
P1SB-03	5	5.5	09/02/09	< 0.049	0.073	0.042 J	0.19	0.24	0.29	0.12	0.11	0.23	0.035 J	0.3	0.021 J	0.097	0.039 J	0.22	0.38
	9.5	10	09/02/09	< 0.005	< 0.005	0.0024 J	0.0036 J	0.0032 J	0.0036 J	0.0019 J	0.0013 J	0.0035 J	< 0.005	0.0081	< 0.005	0.0016 J	< 0.005	0.0017 J	0.014
P1SB-04	2	2.5	08/28/09	0.045 J	< 0.05	0.026 J	0.063	0.077	0.092	0.051	0.032 J	0.073	0.016 J	0.12	0.018 J	0.042 J	0.15	0.12	0.12
	4.5	5	08/28/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.0021 J	< 0.005	< 0.005	< 0.005	0.0011 J	0.0019 J
P2SB-01	1.5	2	08/28/09	0.15 J	0.13 J	0.64	3.2	3.7	5.2	1.9	1.8	3.4	0.69	5.9	0.15 J	1.8	0.14 J	3.4	4.9
	9.5	10	08/28/09	13	1.4 J	25	47	45	53	26	17	44	7.5	140	16	25	8.1	130	100
P2SB-03	1.5	2	09/02/09	< 0.005	0.0012 J	0.0016 J	0.0068	0.0062	0.011	0.0039 J	< 0.005	0.014	0.0012 J	0.014	< 0.005	0.003 J	0.0039 J	0.018	0.018
	9.5	10	09/02/09	< 0.005	0.0019 J	0.0059	0.012	0.0091	0.014	0.0086	0.0031 J	0.019	0.003 J	0.02	0.007	0.0059	0.015	0.041	0.023
P2SB-05	5	5.5	08/28/09	< 0.025	0.025	0.02 J	0.026	0.035	0.051	0.056	0.012 J	0.051	0.011 J	0.035	0.0067 J	0.033	0.011 J	0.069	0.045
	9.5	10	08/28/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
P2SB-06	5.5	6	09/08/09	0.01	0.028	0.045	0.17	0.29	0.29	0.16	0.085	0.17	0.051	0.2	0.009 J	0.15	0.019	0.13	0.22
	9.5	10	09/08/09	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049
	19.5	20	09/08/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
P2SB-07	1	1.5	12/07/09	0.003 J	0.011	0.018	0.064	0.051	0.076	0.032	0.02	0.091	0.013	0.097	0.0054	0.032	0.03	0.12	0.11
	7	7.5	12/07/09	0.0089	0.011	0.031	0.045	0.048	0.063	0.028	0.012	0.06	0.011	0.14	0.018	0.023	0.069	0.15	0.1

Table 8
PAH Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

Location ID	Start Depth (ft)	End Depth (ft)	Chemical Name	Acenaphthene	Acenaphthylene	Anthracene	Benzo (a) anthracene	Benzo (a) pyrene	Benzo (b) fluoranthene	Benzo (g,h,i) perylene	Benzo (k) fluoranthene	Chrysene	Dibenzo(a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-cd) pyrene	Naphthalene	Phenanthrene	Pyrene
			ESL Residential	19	13	2.8	0.38	0.038	0.38	27	0.38	23	0.062	40	8.9	0.62	1.3	11	85
			ESL Commercial	19	13	2.8	1.3	0.13	1.3	27	1.3	23	0.21	40	8.9	2.1	2.8	11	85
			Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
			Sample Date																
P2SB-08	1	1.5	12/07/09	< 0.2	< 0.2	0.064 J	0.24	0.24	0.39	0.17 J	0.12 J	0.37	0.058 J	0.42	< 0.2	0.15 J	0.2 J	0.32	0.43
	7	7.5	12/07/09	0.0094	0.0074	0.031	0.099	0.11	0.14	0.085	0.037	0.12	0.02	0.24	0.025	0.072	0.028	0.16	0.25
P2SB-09	1	1.5	12/07/09	0.1	0.07 J	0.37	1.1	0.97	1.3	0.54	0.43	1.1	0.15	2.1	0.082 J	0.5	0.17	1.5	2.1
	7	7.5	12/07/09	0.0021 J	0.0037 J	0.0048 J	0.0057	0.0039 J	0.0063	0.0024 J	0.0012 J	0.0081	< 0.0051	0.015	< 0.0051	0.0019 J	0.036	0.026	0.018
P2SB-10	1	1.5	12/09/09	< 0.99	< 0.99	< 0.99	0.31 J	0.43 J	0.48 J	0.44 J	< 0.2*	0.61 J	< 0.2*	0.77 J	< 0.99	0.32 J	< 0.99	0.47 J	0.93 J
	7	7.5	12/09/09	0.0068	0.068	0.082	0.16	0.17	0.2	0.15	0.069	0.2	0.04	0.24	0.028	0.11	0.05	0.25	0.32
P3SB-01	1.5	2	09/02/09	< 0.0049	< 0.0049	< 0.0049	0.0014 J	0.0027 J	0.0028 J	0.0015 J	< 0.0049	0.0029 J	< 0.0049	0.0018 J	< 0.0049	< 0.0049	< 0.0049	0.0015 J	0.003 J
	5	5.5	09/02/09	< 0.005	0.0025 J	0.0023 J	0.014	0.02	0.023	0.013	< 0.005	0.018	0.003 J	0.022	< 0.005	0.011	0.0018 J	0.013	0.031
P3SB-02	6	6.5	08/28/09	< 0.025	< 0.025	0.013 J	0.017 J	0.021 J	0.028	0.012 J	0.0091 J	0.027	0.0051 J	0.033	0.0085 J	0.011 J	0.0065 J	0.041	0.033
	10	10.5	08/28/09	0.0041 J	0.012	0.042	0.063	0.054	0.079	0.027	0.026	0.071	0.0096	0.26	0.0095	0.027	0.0086	0.26	0.15
	20	20.5	08/28/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
P4SB-01	5	5.5	09/02/09	0.013 J	0.01 J	0.045	0.13	0.16	0.22	0.1	0.069	0.14	0.034	0.25	0.011 J	0.099	0.026	0.17	0.23
	9.5	10	09/02/09	< 0.005	< 0.005	< 0.005	0.002 J	0.0022 J	0.0039 J	0.0016 J	0.0011 J	0.0031 J	< 0.005	0.0023 J	< 0.005	0.0012 J	< 0.005	0.0034 J	0.0037 J
P4SB-03	1.5	2	09/03/09	< 0.005	< 0.005	< 0.005	0.0013 J	< 0.005	0.0031 J	0.0013 J	< 0.005	0.0027 J	< 0.005	0.0022 J	0.0011 J	< 0.005	< 0.005	0.0044 J	0.0028 J
	9.5	10	09/03/09	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049
P4SB-04	5	5.5	09/03/09	1.2	0.43 J	3.1	6.6	5.6	6.3	2.7	2.5	6.5	0.97	14	1.2	2.7	0.56 J	12	12
	9.5	10	09/03/09	< 0.005	< 0.005	< 0.005	0.0014 J	0.0014 J	0.0019 J	< 0.005	< 0.005	0.0015 J	< 0.005	0.0025 J	< 0.005	< 0.005	< 0.005	0.0018 J	0.0026 J
P4SB-05	1.5	2	09/03/09	< 0.0049	0.0017 J	0.0036 J	0.019	0.019	0.022	0.01	0.0081	0.019	0.0037 J	0.024	0.0016 J	0.009	0.0025 J	0.016	0.026
	9.5	10	09/03/09	< 0.005	< 0.005	0.0017 J	0.0013 J	0.0011 J	0.0029 J	0.0017 J	< 0.005	0.0027 J	< 0.005	0.0031 J	0.0028 J	< 0.005	< 0.005	0.0045 J	0.011
P4SB-06	1.5	2	09/03/09	0.12	< 0.099	0.18	3.1	5.1	8	4.5	2.5	3.8	1.4	3.1	0.063 J	4.1	0.13	0.96	3
P4SB-07	1.5	2	09/03/09	< 0.005	< 0.005	0.0025 J	0.0012 J	< 0.005	0.0052	0.0039 J	< 0.005	0.0058	< 0.005	0.0035 J	0.0037 J	0.002 J	< 0.005	0.007	0.0042 J
	4.5	5	09/03/09	< 0.005	< 0.005	< 0.005	0.0019 J	< 0.005	0.0028 J	0.0019 J	< 0.005	0.0038 J	< 0.005	0.0042 J	< 0.005	0.001 J	< 0.005	0.0026 J	0.0045 J
P4SB-08	1.5	2	09/03/09	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031	0.02 J	< 0.031	< 0.031	0.026 J	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031	0.01 J	0.011 J
	5	5.5	09/03/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
P4SB-09	1.5	2	09/08/09	< 0.025	< 0.025	< 0.025	0.0066 J	0.011 J	0.018 J	0.0094 J	< 0.025	0.03	< 0.025	0.0098 J	0.0074 J	< 0.025	< 0.025	0.025	0.015 J
	4	4.5	09/08/09	< 0.005	< 0.005	< 0.005	< 0.005	0.0016 J	0.0068	0.0047 J	< 0.005	0.011	0.0021 J	< 0.005	0.019	0.0018 J	< 0.005	0.01	0.0046 J
P4SB-12	1	1.5	12/16/09	< 0.1	0.094 J	0.13	0.42	0.46	0.63	0.23	0.17	0.61	0.074 J	0.67	0.031 J	0.23	0.2	0.67	0.8
	12.5	13	12/16/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
P4SB-13	1	1.5	12/16/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
P4SB-14	1	1.5	12/14/09	< 0.35	< 0.35	< 0.35	< 0.35	< 0.07*	< 0.35	< 0.35	< 0.35	0.087 J	< 0.35	< 0.35	< 0.35	< 0.35	< 0.35	< 0.35	< 0.35
P4SB-15	1	1.5	12/14/09	< 0.25	< 0.25	< 0.25	< 0.25	< 0.05*	< 0.25	< 0.25	< 0.25	0.14 J	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	0.17 J	0.092 J
P4SB-16	1	1.5	12/16/09	< 0.7	< 0.7	< 0.7	< 0.7	< 0.14*	< 0.14*	< 0.7	< 0.14*	0.31 J	< 0.14*	< 0.7	< 0.7	< 0.14*	< 0.7	< 0.7	< 0.7
	9.5	10	12/16/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.0011 J	0.0015 J	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
P5SB-01	5	5.5	08/28/09	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.0059 J	< 0.02	0.0044 J	< 0.02	< 0.02	< 0.02	0.0059 J	0.0057 J
P5SB-02	1.5	2	09/08/09	< 0.005	< 0.005	0.0017 J	0.01	0.016	0.018	0.017	0.0062	0.012	0.0042 J	0.014	< 0.005	0.013	0.0024 J	0.011	0.015
	4.5	5	09/08/09	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049
P5SB-03	1.5	2	09/10/09	< 0.12	< 0.12	< 0.12	< 0.12	< 0.025*	0.029 J	< 0.12	< 0.12	0.078 J	< 0.025*	0.03 J	< 0.12	< 0.12	< 0.12	0.07 J	0.079 J
	4.5	5	09/10/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.0013 J	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
P5SB-04	1.5	2	09/10/09	< 0.025	< 0.025	< 0.025	0.013 J	0.021 J	0.029	0.018 J	< 0.025	0.025	0.005 J	0.021 J	< 0.025	0.013 J	0.0083 J	0.02 J	0.029
	4	4.5	09/10/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

Table 8
PAH Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

Location ID	Start Depth (ft)	End Depth (ft)	Chemical Name	Acenaphthene	Acenaphthylene	Anthracene	Benzo (a) anthracene	Benzo (a) pyrene	Benzo (b) fluoranthene	Benzo (g,h,i) perylene	Benzo (k) fluoranthene	Chrysene	Dibenzo(a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-cd) pyrene	Naphthalene	Phenanthrene	Pyrene
			ESL Residential	19	13	2.8	0.38	0.038	0.38	27	0.38	23	0.062	40	8.9	0.62	1.3	11	85
			ESL Commercial	19	13	2.8	1.3	0.13	1.3	27	1.3	23	0.21	40	8.9	2.1	2.8	11	85
			Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
			Sample Date																
P5SB-05	1.5	2	09/10/09	< 0.0049	0.0026 J	0.003 J	0.0062	0.0088	0.0084	0.0066	0.0026 J	0.0066	< 0.0049	0.017	0.0014 J	0.005	< 0.0049	0.015	0.021
	4	4.5	09/10/09	< 0.005	0.0011 J	0.0014 J	0.0034 J	0.0047 J	0.0043 J	0.0034 J	0.0015 J	0.0035 J	< 0.005	0.0089	< 0.005	0.0025 J	< 0.005	0.0064	0.012
P5SS-06	1	1.5	12/14/09	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	0.0013 J	< 0.0049	< 0.0049	< 0.0049	< 0.0049	0.0021 J	< 0.0049	< 0.0049
P5SS-07	1	1.5	12/08/09	< 0.4	< 0.4	< 0.4	< 0.08*	< 0.08*	< 0.08*	< 0.4	< 0.08*	< 0.4	< 0.08*	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
P5SS-08	1	1.5	12/08/09	< 0.015	< 0.015	< 0.015	0.0045 J	0.006 J	0.0062 J	0.0082 J	< 0.015	0.0099 J	< 0.015	0.0067 J	< 0.015	0.0037 J	0.0034 J	0.0077 J	0.011 J
P6SB-01	5.5	6	09/09/09	0.0041 J	0.038	0.049	0.2	0.23	0.25	0.15	0.074	0.23	0.048	0.26	0.012	0.14	0.023	0.25	0.31
	9.5	10	09/09/09	< 0.005	0.0023 J	0.0039 J	0.014	0.014	0.018	0.01	0.0042 J	0.022	0.0039 J	0.016	0.0029 J	0.0072	0.0049 J	0.023	0.023
	19.5	20	09/09/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
P6SB-02	1.5	2	08/27/09	< 0.049	0.015 J	0.019 J	0.073	0.094	0.13	0.037 J	0.053	0.098	0.01 J	0.12	< 0.049	0.027 J	< 0.049	0.068	0.18
	5	5.5	08/27/09	< 0.5	< 0.5	< 0.5	< 0.099*	< 0.5	0.12 J	< 0.5	< 0.099*	0.15 J	< 0.099*	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
P6SB-03	5	5.5	09/03/09	< 0.005	0.0011 J	0.0011 J	0.0042 J	0.0053	0.0076	0.0053	0.0025 J	0.0064	0.0015 J	0.0055	< 0.005	0.0043 J	0.0011 J	0.0055	0.0059
	9.5	10	09/03/09	< 0.075	< 0.075	< 0.075	< 0.075	< 0.015*	< 0.075	0.019 J	< 0.075	< 0.075	< 0.015*	< 0.075	< 0.075	< 0.075	< 0.075	< 0.075	< 0.075
P6SB-05	1.5	2	09/11/09	< 0.005	< 0.005	< 0.005	< 0.005	0.0013 J	0.0023 J	0.0016 J	< 0.005	0.0015 J	< 0.005	0.0019 J	< 0.005	0.0014 J	< 0.005	0.0023 J	0.0024 J
	3.5	4	09/11/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
P6SB-06	1.5	2	09/09/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	4.5	5	09/09/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
P6SB-07	4.5	5	09/09/09	0.0017 J	0.007	0.01	0.066	0.11	0.11	0.068	0.034	0.08	0.013	0.1	0.0025 J	0.055	0.0024 J	0.049	0.12
	9.5	10	09/09/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
P6SB-08	1.5	2	09/09/09	< 0.031	< 0.031	< 0.031	0.021 J	0.028 J	0.037	0.025 J	< 0.031	0.033	< 0.031	0.027 J	< 0.031	0.018 J	< 0.031	0.017 J	0.037
	4.5	5	09/09/09	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.03 J	< 0.05	0.018 J	0.014 J	< 0.05	< 0.05	< 0.05	0.04 J
P6SS-11	1	1.5	12/07/09	< 0.099	< 0.099	< 0.099	< 0.099	0.02 J	0.029 J	0.022 J	< 0.099	0.035 J	< 0.02*	0.02 J	< 0.099	< 0.099	< 0.099	< 0.099	0.03 J
P7SB-01	1.5	2	09/10/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	4.5	5	09/10/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
P7SB-02	4.5	5	09/10/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	9.5	10	09/10/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
P8SB-01	5	5.5	08/31/09	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049
	8.5	9	08/31/09	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049
	18.5	19	08/31/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
P8SB-02	1	1.5	12/08/09	0.39	1.2	2.7	6.6	6.5	5.8	2.8	2.5	6.7	1.1	10	1.1	3.1	0.31	5.7	12
	4.5	5	12/08/09	4.2	0.56	7.7	9.8	7.2	8	2.6	3.4	9	1.2	21	6.7	3	6.8	26	19
P9SB-01	4.5	5	09/09/09	< 0.005	< 0.005	< 0.005	0.0011 J	0.0011 J	0.0016 J	0.0012 J	< 0.005	0.0012 J	< 0.005	0.0021 J	< 0.005	< 0.005	< 0.005	0.0015 J	0.0023 J
	10.5	11	09/09/09	0.1	0.0084	0.1	0.4	0.48	0.61	0.25	0.21	0.4	0.075	0.66	0.045	0.23	0.39	0.29	0.76
P9SB-02	6.5	7	08/28/09	< 0.005	0.0012 J	0.0022 J	0.0039 J	0.0038 J	0.006	0.0032 J	0.0012 J	0.0072	0.0012 J	0.0053	< 0.005	0.0022 J	0.011	0.018	0.0061
	9.5	10	08/28/09	< 0.005	< 0.005	0.0023 J	0.0052	0.0037 J	0.0074	0.0039 J	0.0017 J	0.011	0.0018 J	0.0057	< 0.005	0.0026 J	0.0062	0.02	0.0072
P9SB-04	5.5	6	09/09/09	< 0.062	< 0.062	< 0.062	0.031 J	0.037 J	0.055 J	0.047 J	< 0.062	0.037 J	< 0.012*	0.046 J	< 0.062	0.033 J	< 0.062	0.034 J	0.052 J
	14.5	15	09/09/09	0.1	< 0.062	< 0.062	0.055 J	< 0.012*	< 0.062	0.018 J	< 0.062	0.28	< 0.012*	0.066	< 0.062	< 0.062	0.035 J	< 0.062	0.17
	29.5	30	09/09/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
P9SB-05	6	6.5	08/26/09	0.42	0.16 J	2.7	6.2	6.8	8.7	3.9	2.8	6.4	1.2	15	0.45	3.7	0.25	11	13
	9.5	10	08/26/09	0.0051	0.0059	0.019	0.065	0.091	0.097	0.035	0.036	0.073	0.011	0.088	0.0065	0.032	0.0096	0.067	0.13

Table 8
PAH Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	Acenaph-thene	Acenaph-thylene	Anthracene	Benzo (a) anthracene	Benzo (a) pyrene	Benzo (b) fluoran-thene	Benzo (g,h,i) perylene	Benzo (k) fluoran thene	Chrysene	Dibenzo(a,h) anthracene	Fluoran-thene	Fluorene	Indeno (1,2,3-cd) pyrene	Naphthalene	Phenan-threne	Pyrene
			ESL Residential	**19**	**13**	**2.8**	**0.38**	**0.038**	**0.38**	**27**	**0.38**	**23**	**0.062**	**40**	**8.9**	**0.62**	**1.3**	**11**	**85**
			ESL Commercial	**19**	**13**	**2.8**	**1.3**	**0.13**	**1.3**	**27**	**1.3**	**23**	**0.21**	**40**	**8.9**	**2.1**	**2.8**	**11**	**85**
			Unit	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
Location ID	**Start Depth (ft)**	**End Depth (ft)**	**Sample Date**																
P9SB-06	5	5.5	08/27/09	< 5	< 5	< 1*	< 1*	< 1*	< 1*	< 5	< 1*	< 5	< 1*	< 5	< 5	< 5	< 5	< 5	< 5
	14.5	15	08/27/09	**4.5**	**14**	**22**	**33**	**37**	**40**	**16**	**13**	**34**	**5.7**	**67**	**12**	**15**	**4**	**69**	**77**
	24.5	25	08/27/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	**0.0012 J**	< 0.005	< 0.005	**0.0011 J**	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	**0.0022 J**	**0.0013 J**
P9SB-07	1	1.5	12/10/09	**0.03 J**	**0.13 J**	**0.19**	**0.51**	**0.77**	**0.81**	**0.97**	**0.29**	**0.66**	**0.12 J**	**1.6**	**0.052 J**	**0.69**	**0.053 J**	**1.1**	**1.8**
	14.5	15	12/10/09	< 0.62	< 0.62	< 0.62	**0.19 J**	**0.17 J**	**0.32 J**	**0.22 J**	< 0.12*	< 0.62	< 0.13*	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	**0.73**
	19.5	20	12/10/09	**0.004 J**	**0.005**	**0.015**	**0.038**	**0.031**	**0.042**	**0.032**	**0.011**	**0.049**	**0.01**	**0.06**	**0.0084**	**0.026**	**0.0079**	**0.054**	**0.076**
P9SB-08	1	1.5	12/10/09	**0.078 J**	**0.14 J**	**0.27**	**0.62**	**0.77**	**0.72**	**0.76**	**0.27**	**0.73**	**0.12 J**	**1.9**	**0.087 J**	**0.63**	**0.091 J**	**1.5**	**1.9**
	14.5	15	12/10/09	< 0.079	< 0.079	< 0.079	< 0.079	< 0.016*	< 0.079	< 0.079	< 0.079	**0.14**	< 0.016*	**0.068 J**	< 0.079	< 0.079	< 0.079	< 0.079	**0.16**
	19.5	20	12/10/09	**0.024 J**	**0.13**	**0.24**	**0.62**	**0.56**	**0.62**	**0.28**	**0.23**	**0.69**	**0.096**	**1.2**	**0.15**	**0.28**	**0.066**	**1**	**1.2**
P9SB-09A	1	1.5	12/10/09	< 0.049	< 0.049	< 0.049	**0.028 J**	**0.031 J**	**0.06**	**0.035 J**	**0.015 J**	**0.087**	< 0.049	**0.11**	< 0.049	**0.025 J**	**0.033 J**	**0.11**	**0.16**
	7	7.5	12/10/09	**0.22**	< 0.1	**0.1**	**0.17**	**0.19**	**0.18**	**0.11**	**0.075 J**	**0.28**	**0.058 J**	**0.3**	**0.5**	**0.085 J**	**5.5**	**0.4**	**0.41**
	14.5	15	12/10/09	**0.004 J**	**0.0032 J**	**0.0094**	**0.0079**	**0.0095**	**0.0096**	**0.0053**	**0.0038 J**	**0.0095**	**0.0016 J**	**0.023**	**0.0064**	**0.004 J**	**0.011**	**0.027**	**0.05**
P9SB-09B	1	1.5	12/09/09	**0.025 J**	**0.14**	**0.23**	**0.54**	**0.73**	**0.79**	**0.72**	**0.22**	**0.83**	**0.13**	**1.5**	**0.067**	**0.56**	**0.51**	**1.3**	**1.5**
	7	7.5	12/09/09	< 0.005	< 0.005	< 0.005	**0.0018 J**	**0.0018 J**	**0.0026 J**	**0.0022 J**	**0.0011 J**	**0.0016 J**	< 0.005	**0.0032 J**	< 0.005	**0.0018 J**	**0.0011 J**	**0.0031 J**	**0.006**
P9SB-10	1	1.5	12/09/09	**0.0032 J**	**0.0017 J**	**0.011**	**0.0088**	**0.0081**	**0.011**	**0.0072**	**0.0028 J**	**0.014**	**0.0021 J**	**0.018**	**0.013**	**0.0055**	**0.0036 J**	**0.025**	**0.019**
	14.5	15	12/09/09	**0.0091**	< 0.0049	**0.006**	**0.0044 J**	< 0.0049	< 0.0049	**0.0018 J**	< 0.0049	**0.026**	< 0.0049	**0.011**	< 0.0049	< 0.0049	**0.0031 J**	**0.016**	**0.018**
	19.5	20	12/09/09	**0.0032 J**	< 0.005	**0.0035 J**	**0.002 J**	< 0.005	**0.0025 J**	**0.0023 J**	< 0.005	**0.0094**	< 0.005	**0.0031 J**	**0.004 J**	< 0.005	**0.0013 J**	**0.0049 J**	**0.0071**
P9SB-11	7	7.5	12/17/09	**0.0037 J**	**0.0012 J**	**0.0051**	**0.0095**	**0.01**	**0.02**	**0.016**	**0.0054**	**0.015**	**0.0029 J**	**0.015**	**0.0082**	**0.011**	**0.0045 J**	**0.018**	**0.017**
	14.5	15	12/17/09	< 0.05	< 0.05	**0.13**	**0.063**	< 0.0099*	**0.057**	< 0.05	< 0.05	**0.21**	< 0.05	**0.11**	< 0.05	< 0.05	< 0.05	**0.58**	**0.25**
P9SB-12	7	7.5	12/17/09	**0.022**	**0.01**	**0.019**	**0.043**	**0.054**	**0.065**	**0.041**	**0.021**	**0.049**	**0.0094 J**	**0.083**	**0.019**	**0.037**	**0.023**	**0.086**	**0.091**
	14.5	15	12/17/09	< 0.25	**0.84**	**1.1**	**2.3**	**3**	**3.2**	**1.1**	**0.95**	**2.4**	**0.45**	**4.8**	**0.4**	**1.2**	**0.42**	**1.1**	**8**
P9SB-13	7	7.5	12/17/09	**0.0067 J**	**0.042**	**0.043**	**0.33**	**0.38**	**0.49**	**0.24**	**0.13**	**0.39**	**0.075**	**0.43**	**0.01**	**0.25**	**0.037**	**0.2**	**0.57**
	14.5	15	12/17/09	< 0.49	< 0.49	< 0.49	**0.26 J**	< 0.0099*	**0.31 J**	< 0.49	< 0.0099*	**0.52**	< 0.49	**0.31 J**	< 0.49	< 0.49	< 0.49	< 0.49	**0.91**
P9SB-14	4	4.5	02/16/10	**0.014**	**0.063**	**0.068**	**0.18**	**0.26**	**0.33**	**0.16**	**0.09**	**0.21**	**0.038**	**0.48**	**0.014**	**0.15**	**0.031**	**0.29**	**0.5**
	10	10.5	02/16/10	< 0.0049	**0.0012**	**0.002**	**0.0044**	**0.006**	**0.0067**	**0.0071**	**0.0017**	**0.0051**	**0.0016**	**0.0088**	< 0.0049	**0.0048**	**0.0013**	**0.0073**	**0.0074**
SPSB-01	5	5.5	08/27/09	< 0.015	< 0.015	< 0.015	**0.0051 J**	**0.0066 J**	**0.0097 J**	**0.0072 J**	**0.0031 J**	**0.0066 J**	< 0.015	**0.0081 J**	< 0.015	**0.005 J**	**0.0037 J**	**0.0082 J**	**0.0084 J**
	9.5	10	08/27/09	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049	< 0.0049
SPSB-02	2.5	3	08/27/09	< 0.5	< 0.5	**0.2 J**	**0.27 J**	**0.31 J**	**0.4 J**	**0.15 J**	**0.18 J**	**0.34 J**	< 0.5	**0.68**	< 0.5	**0.1 J**	< 0.5	**0.77**	**0.84**
	5.5	6	08/27/09	< 0.02	< 0.02	< 0.02	**0.0077 J**	**0.012 J**	**0.014 J**	**0.005 J**	**0.0089 J**	**0.011 J**	< 0.02	**0.016 J**	< 0.02	< 0.02	< 0.02	**0.013 J**	**0.02**
SPSB-03	5	5.5	09/08/09	< 0.005	**0.0038 J**	**0.0044 J**	**0.026**	**0.033**	**0.036**	**0.036**	**0.011**	**0.036**	**0.0064**	**0.044**	**0.0014 J**	**0.027**	**0.0022 J**	**0.034**	**0.07**
	9.5	10	09/08/09	< 0.005	< 0.005	< 0.005	< 0.005	**0.0011 J**	**0.0012 J**	**0.0012 J**	< 0.005	< 0.005	< 0.005	**0.0013 J**	< 0.005	< 0.005	< 0.005	< 0.005	**0.002 J**
SPSB-04	5.5	6	08/31/09	**0.0063 J**	**0.11**	**0.33**	**0.82**	**0.86**	**0.81**	**0.6**	**0.28**	**0.81**	**0.14**	**1.6**	**0.048**	**0.49**	**0.039**	**0.83**	**1.8**
	14.5	15	08/31/09	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	24.5	25	08/31/09	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
SPSB-05	4.5	5	09/10/09	**0.015**	**0.37**	**0.32**	**1.3**	**1.5**	**1.5**	**1.5**	**0.39**	**1.3**	**0.2**	**3.4**	**0.11**	**1.1**	**0.12**	**3.1**	**4**
	9.5	10	09/10/09	**3.9**	**22**	**38**	**71**	**91**	**86**	**31**	**24**	**83**	**7**	**150**	**19**	**32**	**6.1**	**130**	**270**
SPSS-05	1.5	2	12/17/09	< 0.005	< 0.005	**0.0019 J**	**0.0073**	**0.0094**	**0.011**	**0.0094**	**0.003 J**	**0.0091**	**0.0017 J**	**0.011**	< 0.005	**0.0071**	**0.0013 J**	**0.0083**	**0.016**
SPSS-06	1	1.5	12/07/09	< 0.4	< 0.4	< 0.4	**0.51**	**0.95**	**1.4**	**1.3**	**0.41**	**0.68**	**0.38 J**	**0.57**	< 0.4	**1**	< 0.4	**0.18 J**	**0.64**
SPSS-07	1	1.5	12/08/09	< 0.4	< 0.4	< 0.4	**0.18 J**	**0.16 J**	**0.25 J**	**0.11 J**	**0.091 J**	**0.23 J**	< 0.4	**0.27 J**	< 0.4	**0.09 J**	< 0.4	**0.16 J**	**0.3 J**
SPSS-08	1.5	2	12/08/09	< 0.2	**0.047 J**	**0.041 J**	**0.2**	**0.27**	**0.33**	**0.21**	**0.11 J**	**0.25**	**0.043 J**	**0.32**	< 0.2	**0.17 J**	< 0.2	**0.15 J**	**0.44**
SPTP-01	4.5	5	08/27/09	< 0.035	**0.012 J**	**0.016 J**	**0.05**	**0.065**	**0.084**	**0.039**	**0.033 J**	**0.064**	**0.0083 J**	**0.085**	< 0.035	**0.024 J**	**0.009 J**	**0.064**	**0.12**
	5.5	6	08/27/09	< 0.036	**0.041**	**0.041**	**0.15**	**0.2**	**0.27**	**0.086**	**0.089**	**0.22**	**0.02 J**	**0.27**	**0.013 J**	**0.063**	**0.012 J**	**0.21**	**0.47**

Table 8
PAH Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	Acenaphthene	Acenaphthylene	Anthracene	Benzo (a) anthracene	Benzo (a) pyrene	Benzo (b) fluoranthene	Benzo (g,h,i) perylene	Benzo (k) fluoran thene	Chrysene	Dibenzo(a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-cd) pyrene	Naphthalene	Phenanthrene	Pyrene
			ESL Residential	19	13	2.8	0.38	0.038	0.38	27	0.38	23	0.062	40	8.9	0.62	1.3	11	85
			ESL Commercial	19	13	2.8	1.3	0.13	1.3	27	1.3	23	0.21	40	8.9	2.1	2.8	11	85
			Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Location ID	Start Depth (ft)	End Depth (ft)	Sample Date																
SPTP-02	3.5	3.5	08/28/09	< 0.15	< 0.15	**0.052 J**	**0.26**	**0.29**	**0.43**	**0.22**	**0.15**	**0.29**	**0.057 J**	**0.46**	< 0.15	**0.19**	< 0.15	**0.23**	**0.44**
SPTP-03	4	4	08/28/09	< 0.15	< 0.15	**0.045 J**	< 0.15	**0.066 J**	**0.067 J**	**0.18**	< 0.15	**0.034 J**	< 0.15	**0.042 J**	< 0.15	**0.078 J**	< 0.15	< 0.15	**0.048 J**
	5.5	5.5	08/28/09	**0.086 J**	**0.069 J**	**0.19**	**0.6**	**0.86**	**1.2**	**0.7**	**0.37**	**0.7**	**0.2**	**1.1**	**0.081 J**	**0.65**	< 0.15	**0.61**	**0.9**
SPTP-04	3	3	08/31/09	< 0.99	< 0.99	**0.37 J**	**1**	**1.1**	**1.6**	**0.75 J**	**0.5 J**	**1.1**	**0.21 J**	**2**	**0.21 J**	**0.65 J**	< 0.99	**1.4**	**1.7**
	7	7	08/31/09	< 0.099	**0.094 J**	**0.067 J**	**0.24**	**0.39**	**0.59**	**0.2**	**0.21**	**0.34**	**0.066 J**	**0.46**	< 0.099	**0.22**	< 0.099	**0.21**	**0.41**
SPTP-06	3.5	3.5	08/31/09	**0.015 J**	< 0.05	**0.04 J**	**0.14**	**0.2**	**0.27**	**0.18**	**0.095**	**0.16**	**0.048 J**	**0.23**	< 0.05	**0.15**	< 0.05	**0.14**	**0.23**
	7	7	08/31/09	< 0.05	< 0.05	**0.028 J**	**0.12**	**0.1**	**0.13**	**0.057**	**0.051**	**0.14**	**0.015 J**	**0.16**	< 0.05	**0.045 J**	< 0.05	**0.02 J**	**0.18**
TGU-16	0.5	1	11/17/09	< 0.4	< 0.4	**0.14 J**	**0.28 J**	**0.3 J**	**0.37 J**	**0.22 J**	< 0.079*	**0.38 J**	< 0.4	**0.6**	< 0.4	**0.18 J**	< 0.4	**0.62**	**0.63**
	9.5	10	11/17/09	**0.33 J**	**4.8**	**5.8**	**24**	**36**	**32**	**28**	**7.5**	**27**	**4.8**	**40**	**1.5**	**23**	**0.95 J**	**15**	**100**
	14	14.5	11/17/09	**2**	**1.3**	**0.56**	**0.46**	**0.67**	**0.52**	**0.5**	**0.21 J**	**0.56**	**0.13 J**	**1.6**	**1.3**	**0.44**	**8**	**4.1**	**2**
	19.5	20	11/17/09	**5.6**	**3.2**	**7.1**	**5.3**	**5.3**	**4.7**	**2.7**	**1.5**	**5**	**0.52 J**	**13**	**6.7**	**2.3**	**38**	**28**	**15**
TGU-18	1	1.5	11/22/09	**0.23 J**	**1.2**	**1.2**	**3.5**	**3.9**	**3.2**	**2.6**	**0.95**	**3.7**	**0.67**	**7.5**	**0.39**	**2.2**	**0.28**	**4**	**8.8**
	9.5	10	11/22/09	**0.36 J**	**1.8**	**3.1**	**6.5**	**6.4**	**4.7**	**3.9**	**1.8**	**6.3**	**0.89**	**15**	**0.78**	**3.1**	**0.6**	**8.9**	**20**
	11.5	12	11/22/09	**0.45**	**0.095**	**0.55**	**0.57**	**0.52**	**0.42**	**0.3**	**0.14**	**0.53**	**0.069**	**1.4**	**0.41**	**0.23**	**0.49**	**2.1**	**2.1**
TGU-23	1	1.5	11/20/09	**0.12 J**	**0.55**	**0.62**	**1.8**	**2.1**	**2.1**	**1.8**	**0.51**	**2**	**0.34**	**4.1**	**0.27**	**1.4**	**0.24 J**	**3.2**	**4.9**
	9	9.5	11/20/09	**240**	**140**	**580**	**550**	**730**	**670**	**300**	**200**	**600**	**46 J**	**1,800**	**160**	**260**	**540**	**1,700**	**2,500**
	13	13.5	11/20/09	**800**	**800**	**850**	**800**	**1,200**	**1200**	**540**	**370**	**1,000**	**79 J**	**3,900**	**400**	**510**	**2,300**	**6,000**	**4,400**
TGU-24	1	1.5	11/20/09	**0.062**	**0.031 J**	**0.18**	**0.59**	**0.65**	**0.95**	**0.47**	**0.32**	**0.65**	**0.12**	**1**	**0.069**	**0.46**	**0.023 J**	**0.63**	**1.1**

Notes:

All results are presented in miligrams per kilogram (mg/kg).

Samples analyzed by EPA Method 8260B.

ft - feet

bgs - below ground surface

PAH - Polycyclic aromatic Hydrocarbons

NE - None established

< 0.005 - Not detected above the individual laboratory reporting limit for each analyte

gray shading indicates result exceeds residential ESL

blue shading indicates result exceeds both residential and commercial ESLs

bold - indicates that results exceed laboratory reporting limits

* Sample reported to the method detection limit (MDL)

ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency, Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008, Table B - Groundwater and Soil for Residential and Commerical Land Use.

-- Not analyzed

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.

Table 9
Metals Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

Location ID	Start Depth (ft)	End Depth (ft)	Sample Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
			ESL Residential	6.3	0.39	750	4	1.7	750 ^{1}	8	40	230	200	1.3	40	150	10	20	1.3	16	600
			ESL Commercial	40	1.6	1,500	8	7.4	750 ^{1}	8	80	230	750	10	40	150	10	40	16	200	600
			Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/Kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		Background Concentrations	Soil	9.05 ^{2}	11.5 ^{3}	314.4 ^{2}	0.71 ^{2}	2.2 ^{2}-3.14^{5}	81 ^{4}	NA	11 ^{4}	124 ^{2}-175 ^{5}	8.99 ^{2}	2.28 ^{2}	2.68 ^{2}	50 - 2,930^{5}	0.5 ^{4}	1.43 ^{2}	1 ^{4}	83^{2}-117^{5}	110^{2}-423^{5}
			Serpentinite Rock	12- 14^{6}	0.8- 10^{6}	0.9- 11.4^{6}	0.5 ^{6}	0.5 ^{6}	1,300 ^{4}	NA	140 ^{4}	5- 16.6 ^{6}	0.2- 36.1^{6}	0.1^{6}- 0.2^{6}	5 ^{6}	499- 1910^{6}	5 ^{6}	5 ^{6}	1.6 - 3 ^{6}	5.0- 15.6^{6}	20.8- 51.7^{6}
CCSB-01	5	5.5	09/02/09	NA	NA	NA	NA	0.85	420	NA	NA	NA	5.3	NA	NA	1,100	NA	NA	NA	NA	65
	9.5	10	09/02/09	NA	NA	NA	NA	0.54	45	NA	NA	NA	6.4	NA	NA	44	NA	NA	NA	NA	43
CCSB-02	1.5	2	09/02/09	NA	NA	NA	NA	2.2	100	NA	NA	NA	310	NA	NA	90	NA	NA	NA	NA	610
	9.5	10	09/02/09	NA	NA	NA	NA	0.099 J	3.4	NA	NA	NA	75	NA	NA	9.0	NA	NA	NA	NA	270
CCSB-03	9	9.5	08/27/09	< 0.50	6	21	0.29	0.23 J	45	NA	9.2	17 J	10 J	0.048	0.56	48	< 0.50 UJ	< 0.25	< 0.50	40	43 J
	14.5	15	08/28/09	< 0.50 UJ	7.4	22	0.28	0.23 J	43	NA	7.8	15 J	62 J	0.11	0.53	43	< 0.50 UJ	< 0.25	< 0.50 UJ	37	42 J
	28.5	29	08/28/09	< 0.50 UJ	4.3	20	0.30	0.19 J	46	NA	8.5	17 J	4.2 J	0.036	0.55	47	0.15 J	< 0.25	< 0.50 UJ	42	45 J
CCSB-04	1	1.5	12/14/09	NA	4.9 J	NA	NA	0.82	29	NA	15 J	19	29 J	0.099	NA	42 J	NA	NA	NA	NA	71 J
	9.5	10	12/14/09	NA	< 0.25 UJ	NA	NA	1.3	700	NA	44 J	7.6	3.5 J	0.073	NA	1,500 J	NA	NA	NA	NA	1,900 J
	9.5	10	02/17/10	NA	NA	NA	NA	NA	NA	< 0.40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CCSB-05	1	1.5	12/14/09	NA	6.4 J	NA	NA	2	1,000	NA	34 J	480	300 J	1.1	NA	1,200 J	NA	NA	NA	NA	1000 J
	1.5	2	02/17/10	NA	NA	NA	NA	NA	NA	1.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.5	10	12/14/09	NA	4.6 J	NA	NA	0.72	52	NA	10 J	18	8.3 J	0.066	NA	54 J	NA	NA	NA	NA	52 J
CCSS-06	1	1.5	12/14/09	NA	4.0 J	NA	NA	1.8	80	NA	17 J	160	290 J	0.70	NA	220 J	NA	NA	NA	NA	430 J
CCSS-07	1	1.5	12/14/09	NA	17 J	NA	NA	1.1	210	NA	11 J	390	420 J	0.49	NA	130 J	NA	NA	NA	NA	660 J
	1.5	2	02/17/10	NA	NA	NA	NA	NA	NA	4.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CPSB-01	4.5	5	09/11/09	NA	NA	NA	NA	< 0.25	8.0	NA	NA	NA	220	NA	NA	8.7	NA	NA	NA	NA	10
	9.5	10	09/11/09	NA	NA	NA	NA	< 0.25	37	NA	NA	NA	66	NA	NA	140	NA	NA	NA	NA	36
CPSB-02	4.5	5	09/11/09	NA	NA	NA	NA	0.12 J	84	NA	NA	NA	32	NA	NA	50	NA	NA	NA	NA	75
	9.5	10	09/11/09	NA	NA	NA	NA	0.11 J	79	NA	NA	NA	0.29	NA	NA	87	NA	NA	NA	NA	91
CPSB-03	6	6.5	08/31/09	< 0.50 UJ	28 J	120	0.15	0.95	39	NA	51 J	200	400	13	1.7	75	< 0.50 UJ	< 0.25 UJ	< 0.50 UJ	72	96
	9	9.5	08/31/09	< 0.50 UJ	9.7 J	61	0.13	0.70	72	NA	28 J	68	150	1.6	< 0.25	63	< 0.50 UJ	< 0.25 UJ	< 0.50 UJ	73	76
	14	14.5	08/31/09	< 0.50 UJ	1.6 J	130	0.15	0.067 J	52	NA	19 J	76	< 0.25 UJ	< 0.098	0.22 J	39	< 0.50 UJ	< 0.25	< 0.50 UJ	110	51
CPSB-04A	1	1.5	12/08/09	NA	11	NA	NA	0.10 J	120	NA	21	260	87	0.24	NA	130	NA	NA	NA	NA	230
CPSB-04B	1	1.5	12/14/09	NA	4.8 J	NA	NA	0.97	73	NA	13 J	73	37 J	0.26	NA	94 J	NA	NA	NA	NA	120 J
	9.5	10	12/14/09	NA	23 J	NA	NA	7.5	50	NA	32 J	430	1,100 J	0.52	NA	69 J	NA	NA	NA	NA	2,000 J
P1SB-02	1.5	2	09/02/09	NA	NA	NA	NA	0.65	41	NA	NA	NA	83	NA	NA	38	NA	NA	NA	NA	130
	9.5	10	09/02/09	NA	NA	NA	NA	0.76	1,100	NA	NA	NA	0.63	NA	NA	1,600	NA	NA	NA	NA	18
P1SB-03	5	5.5	09/02/09	NA	NA	NA	NA	1.9	88	NA	NA	NA	890	NA	NA	110	NA	NA	NA	NA	440
	9.5	10	09/02/09	NA	NA	NA	NA	0.87	250	NA	NA	NA	2.6	NA	NA	1,400	NA	NA	NA	NA	3,300
P1SB-04	2	2.5	08/28/09	< 0.50	4	47	0.082 J	1.2	900	NA	52	190	200	1.8	< 0.25	1,200	< 0.50	< 0.25	< 0.50	29	420
	4.5	5	08/28/09	< 0.50	< 0.25	6.2	< 0.10	0.20 J	730	NA	70	32	13	0.018 J	< 0.25	1,600	1.5	< 0.25	< 0.50	16	49
P2SB-01	1.5	2	08/28/09	NA	NA	NA	NA	1.9	85	NA	NA	NA	2,800	NA	NA	140	NA	NA	NA	NA	710
	9.5	10	08/28/09	NA	NA	NA	NA	1.1	9.9	NA	NA	NA	390	NA	NA	15	NA	NA	NA	NA	490
P2SB-03	1.5	2	09/02/09	10	14	61	0.18	3.3	56	NA	15	2,100	260	0.10	1.1	50	< 0.50	0.65	< 0.50	50	1,400
	9.5	10	09/02/09	4.8	23	230	0.31	2	100	NA	13	8,300	590	0.088	1.1	160	< 0.50	6.1	< 0.50	43	1,800
P2SB-05	5	5.5	08/28/09	NA	NA	NA	NA	0.13 J	480	NA	NA	NA	7.7	NA	NA	1,100	NA	NA	NA	NA	35
	9.5	10	08/28/09	NA	NA	NA	NA	0.17 J	96	NA	NA	NA	0.23 J	NA	NA	76	NA	NA	NA	NA	85

Table 9
Metals Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
			ESL Residential	6.3	0.39	750	4	1.7	750 ^{1}	8	40	230	200	1.3	40	150	10	20	1.3	16	600
			ESL Commercial	40	1.6	1,500	8	7.4	750 ^{1}	8	80	230	750	10	40	150	10	40	16	200	600
			Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/Kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		Background Concentrations	Soil	9.05 ^{2}	11.5 ^{3}	314.4 ^{2}	0.71 ^{2}	2.2 ^{2}-3.14^{5}	81 ^{4}	NA	11 ^{4}	124 ^{2}-175 ^{5}	8.99 ^{2}	2.28 ^{2}	2.68 ^{2}	50 - 2,930^{5}	0.5 ^{4}	1.43 ^{2}	1 ^{4}	83^{2}-117^{5}	110^{2}-423^{5}
			Serpentinite Rock	12- 14^{6}	0.8- 10^{6}	0.9- 11.4^{6}	0.5 ^{6}	0.5 ^{6}	1,300 ^{4}	NA	140 ^{4}	5- 16.6 ^{6}	0.2- 36.1^{6}	0.1^{6}- 0.2^{6}	5 ^{6}	499- 1910^{6}	5 ^{6}	5 ^{6}	1.6 - 3 ^{6}	5.0- 15.6^{6}	20.8- 51.7^{6}
Location ID	Start Depth (ft)	End Depth (ft)	Sample Date																		
P2SB-06	5.5	6	09/08/09	2.2	4.5	630	0.29	2.6	270	NA	27	1,600	1,600	0.34	2.1	380	< 0.50	0.42	< 0.50	58	1,400
	9.5	10	09/08/09	< 0.50	< 0.25	3.3	< 0.10	0.65	790	NA	57	11	1.6	0.37	0.065 J	1,200	< 0.50	< 0.25	< 0.50	17	15
	19.5	20	09/08/09	< 0.50	33	300	0.36	0.68	110	NA	14	32	5.5	0.019 J	2.7	100	< 0.50	0.040 J	< 0.50	40	51
P2SB-07	1	1.5	12/07/09	NA	NA	NA	NA	0.086 J	22	NA	NA	NA	110	NA	NA	38	NA	NA	NA	NA	97
	7	7.5	12/07/09	NA	NA	NA	NA	1.5	70	NA	NA	NA	480	NA	NA	74	NA	NA	NA	NA	810
P2SB-08	1	1.5	12/07/09	NA	NA	NA	NA	0.90	68	NA	NA	NA	330	NA	NA	110	NA	NA	NA	NA	360
	7	7.5	12/07/09	NA	NA	NA	NA	1.7	310	NA	NA	NA	390	NA	NA	390	NA	NA	NA	NA	1,400
	7.5	8	02/16/10	NA	NA	NA	NA	NA	NA	< 0.40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
P2SB-09	1	1.5	12/07/09	NA	NA	NA	NA	2.7	120	NA	NA	NA	9,600	NA	NA	380	NA	NA	NA	NA	1,300
	7	7.5	12/07/09	NA	NA	NA	NA	29	35	NA	NA	NA	370	NA	NA	43	NA	NA	NA	NA	11,000
P2SB-10	1	1.5	12/09/09	NA	7	NA	NA	1.7	57	NA	16	140	130	0.15	NA	82	NA	NA	NA	NA	240
	7	7.5	12/09/09	NA	11	NA	NA	2.3	27	NA	15	160	79	0.10	NA	64	NA	NA	NA	NA	560
P3SB-01	1.5	2	09/02/09	< 0.50	2.8	18	0.15	0.29	63	NA	6.5	5.8	9.9	0.0058 J	0.38	60	< 0.50	< 0.25	< 0.50	36	23
	5	5.5	09/02/09	0.14 J	4.9	130	0.15	0.25 J	34	NA	3.4	6.3	200	0.68	0.72	27	< 0.50	0.12 J	< 0.50	25	110
P3SB-02	6	6.5	08/28/09	< 0.50	3.9	98	0.24	0.22 J	300	NA	28	79	45	0.099	0.25 J	340	< 0.50	< 0.25	< 0.50	55	100
	10	10.5	08/28/09	< 0.50	4.1	180	0.26	0.32	380	NA	32	35	200	0.36	0.087 J	710	< 0.50	< 0.25	< 0.50	32	92
	20	20.5	08/28/09	< 0.50	2.7	29	0.19	0.23 J	370	NA	27	13	3.5	0.0082 J	< 0.25	380	< 0.50	< 0.25	< 0.50	45	26
P4SB-01	5	5.5	09/02/09	< 0.50	0.18 J	460	0.10	0.31	110	NA	26	100	15	0.19	< 0.25	160	< 0.50	0.16 J	< 0.50	50	150
	9.5	10	09/02/09	< 0.50	7.9	67	0.49	0.10 J	130	NA	15	24	13	0.079	1.2	180	< 0.50	< 0.25	< 0.50	31	50
P4SB-03	1.5	2	09/03/09	NA	NA	NA	NA	0.084 J	120	NA	NA	NA	8.2	NA	NA	200	NA	NA	NA	NA	52
	9.5	10	09/03/09	NA	NA	NA	NA	0.060 J	120	NA	NA	NA	5.7	NA	NA	260	NA	NA	NA	NA	35
P4SB-04	5	5.5	09/03/09	< 0.50	7.6	110	0.16	0.041 J	27	NA	5.2	160	120	0.17	0.59	43	< 0.50	0.11 J	0.28 J	11	69
	9.5	10	09/03/09	< 0.50	2.5	59	0.15	0.19 J	120	NA	28	84	21	0.022	0.12 J	110	< 0.50	< 0.25	< 0.50	92	59
P4SB-05	1.5	2	09/03/09	< 0.50	1.9	140	0.22	0.073 J	330	NA	39	55	9.3	0.035	0.15 J	590	< 0.50	< 0.25	< 0.50	50	51
	9.5	10	09/03/09	< 0.50	1.5	39	0.21	0.073 J	330	NA	32	27	3.4	0.057	0.11 J	530	< 0.50	< 0.25	< 0.50	22	69
P4SB-06	1.5	2	09/03/09	< 0.50	3.9	92	0.27	0.64	51	NA	9.8	180	120	0.20	0.39	44	< 0.50	< 0.25	< 0.50	45	270
P4SB-07	1.5	2	09/03/09	< 0.50	4.3 J	63	0.18	1.2	680	NA	56 J	30	6.4	0.065	< 0.25 J U	1,200	2.5	< 0.25	< 0.50 UJ	38	190 J
	4.5	5	09/03/09	< 0.50	1.9 J	42	0.23	0.82	630	NA	41 J	24	5.7	0.019 J	< 0.25 U	900	2.1	< 0.25	< 0.50 UJ	36	82 J
P4SB-08	1.5	2	09/03/09	< 0.50	< 0.25	71	0.19	0.20 J	91	NA	29	79	1.0	< 0.020	0.28	46	< 0.50	0.35	< 0.50	160	47
	5	5.5	09/03/09	< 0.50	0.10 J	87	0.17	0.15 J	110	NA	30	77	< 0.25	< 0.020	0.14 J	46	< 0.50	< 0.25	0.25 J	180	43
P4SB-10	1.5	2	09/08/09	NA	NA	NA	NA	0.83	920	NA	NA	NA	0.72	NA	NA	1,400	NA	NA	NA	NA	10
	4.5	5	09/08/09	NA	NA	NA	NA	0.81	350	NA	NA	NA	0.85	NA	NA	1,400	NA	NA	NA	NA	15
P4SB-11	4.5	5	09/11/09	NA	NA	NA	NA	< 0.25	92	NA	NA	NA	0.22 J	NA	NA	41	NA	NA	NA	NA	32
	8.5	9	09/11/09	NA	NA	NA	NA	< 0.25	77	NA	NA	NA	0.28	NA	NA	47	NA	NA	NA	NA	48
P4SB-12	1	1.5	12/16/09	NA	33	NA	NA	5.8	51	NA	33	2,500	300	0.70	NA	93	NA	NA	NA	NA	620
	12.5	13	12/16/09	NA	< 0.25	NA	NA	0.78	160	NA	29	66	1.0	0.029	NA	100	NA	NA	NA	NA	72
	12.5	13	02/17/10	NA	NA	NA	NA	NA	NA	< 0.40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
P4SB-13	1	1.5	12/16/09	NA	< 0.25	NA	NA	0.62	83	NA	20	49	0.80	0.013 J	NA	44	NA	NA	NA	NA	34
P4SB-14	1	1.5	12/14/09	NA	3.8 J	NA	NA	0.91	34	NA	9.8 J	40	16 J	0.054	NA	41 J	NA	NA	NA	NA	64 J

Table 9
Metals Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
			ESL Residential	6.3	0.39	750	4	1.7	750[1]	8	40	230	200	1.3	40	150	10	20	1.3	16	600
			ESL Commercial	40	1.6	1,500	8	7.4	750[1]	8	80	230	750	10	40	150	10	40	16	200	600
			Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/Kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		Background Concentrations	Soil	9.05[2]	11.5[3]	314.4[2]	0.71[2]	2.2[2]-3.14[5]	81[4]	NA	11[4]	124[2]-175[5]	8.99[2]	2.28[2]	2.68[2]	50 - 2,930[5]	0.5[4]	1.43[2]	1[4]	83[2]-117[5]	110[2]-423[5]
			Serpentinite Rock	12- 14[6]	0.8- 10[6]	0.9- 11.4[6]	0.5[6]	0.5[6]	1,300[4]	NA	140[4]	5- 16.6[6]	0.2- 36.1[6]	0.1[6]- 0.2[6]	5[6]	499- 1910[6]	5[6]	5[6]	1.6 - 3[6]	5.0- 15.6[6]	20.8- 51.7[6]
Location ID	Start Depth (ft)	End Depth (ft)	Sample Date																		
P4SB-15	1	1.5	12/14/09	NA	< 0.25 UJ	NA	NA	**0.87**	**89**	NA	**16 J**	**57**	**16 J**	**0.052**	NA	**59 J**	NA	NA	NA	NA	**86 J**
P4SB-16	1	1.5	12/16/09	NA	**3.8**	NA	NA	**0.56**	**27**	NA	**8.6**	**40**	**17**	**0.042**	NA	**46**	NA	NA	NA	NA	**76**
	9.5	10	12/16/09	NA	**3.9**	NA	NA	**0.16 J**	**7.1**	NA	**5.7**	**14**	**21**	**0.046**	NA	**13**	NA	NA	NA	NA	**27**
P5SB-01	5	5.5	08/28/09	< 0.50	**2.3**	**87**	**0.050 J**	**0.16 J**	**130**	NA	**21**	**71**	**17**	**0.092**	**0.25**	**96**	< 0.50	**0.21 J**	< 0.50	**67**	**64**
P5SB-02	1.5	2	09/08/09	< 0.50	**4.1**	**94**	**0.31**	**0.41**	**44**	NA	**11**	**29**	**55**	**0.12**	**1.6**	**41**	< 0.50	< 0.25	< 0.50	**44**	**48**
	4.5	5	09/08/09	**0.43 J**	< 0.25	**110**	**0.20**	**0.71**	**230**	NA	**20**	**95**	**42**	< 0.020	**0.87**	**240**	< 0.50	< 0.25	< 0.50	**59**	**55**
P5SB-03	1.5	2	09/10/09	**0.11 J**	**1.2**	**96**	**0.21 J**	**0.21 J**	**130**	NA	**27**	**82**	**9.8**	**0.23**	**0.27**	**75**	**0.076 J**	< 0.25	< 0.25	**100**	**70**
	4.5	5	09/10/09	< 0.25	< 0.25	**1.9**	< 0.25	< 0.25	**20**	NA	**11**	**59**	**0.068 J**	< 0.020	< 0.25	**12**	< 0.25	< 0.25	< 0.25	**41**	**16**
P5SB-04	1.5	2	09/10/09	NA	NA	NA	NA	**0.15 J**	**52**	NA	NA	NA	**15**	NA	NA	**41**	NA	NA	NA	NA	**35**
	4	4.5	09/10/09	NA	NA	NA	NA	< 0.25	**920**	NA	NA	NA	< 0.25	NA	NA	**1,600**	NA	NA	NA	NA	**28**
P5SB-05	1.5	2	09/10/09	< 0.25	**0.42**	**52**	**0.18 J**	**0.096 J**	**250**	NA	**37**	**53**	**0.13 J**	< 0.021	**0.11 J**	**140**	< 0.25	< 0.25	< 0.25	**93**	**55**
	4	4.5	09/10/09	< 0.25	**0.37**	**44**	**0.072 J**	< 0.25	**210**	NA	**33**	**48**	**0.12 J**	< 0.020	< 0.25	**110**	< 0.25	< 0.25	< 0.25	**100**	**54**
P5SS-06	1	1.5	12/14/09	NA	< 0.25 UJ	NA	NA	**0.44**	**330**	NA	**19 J**	**16**	**0.69 J**	**0.016 J**	NA	**180 J**	NA	NA	NA	NA	**47 J**
	1.5	2	02/17/10	NA	NA	NA	NA	NA	NA	< 0.40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
P5SS-07	1	1.5	12/08/09	NA	**3.1**	NA	NA	**0.085 J**	**36**	NA	**16**	**60**	**8.5**	**0.090**	NA	**52**	NA	NA	NA	NA	**80**
P5SS-08	1	1.5	12/08/09	NA	**1.6**	NA	NA	< 0.25	**95**	NA	**39**	**130**	**8.7**	< 0.020	NA	**59**	NA	NA	NA	NA	**57**
P6SB-01	5.5	6	09/09/09	**38**	**29**	**86**	**0.31**	< 0.25	**24**	NA	**41**	**360**	**640**	**19**	**2.5**	**64**	< 0.50	**6.3**	< 0.50	**40**	**710**
	9.5	10	09/09/09	< 0.50	**660**	**320**	**0.18**	< 0.25	**27**	NA	**23**	**96**	**12**	**0.091**	**0.23 J**	**28**	< 0.50	**0.13 J**	< 0.50	**73**	**71**
	19.5	20	09/09/09	< 0.50	**60**	**61**	**0.47**	< 0.25	**24**	NA	**16**	**48**	**71**	**0.17**	**1.8**	**31**	< 0.50	**0.38**	< 0.50	**33**	**67**
P6SB-02	1.5	2	08/27/09	< 0.50	**3.3**	**94**	**0.25**	**0.43**	**81**	NA	**11**	**44**	**180**	**0.18**	**1.1**	**110**	< 0.50	**3.4**	**0.94**	**37**	**200**
	5	5.5	08/27/09	< 0.50	**2.1**	**130**	**0.40**	**0.47**	**41**	NA	**13**	**82**	**64**	**0.080**	**1.1**	**200**	< 0.50	< 0.25	< 0.50	**35**	**180**
P6SB-03	5	5.5	09/03/09	**1.3**	< 0.25	**36**	**0.21**	**0.19 J**	**88**	NA	**29**	**74**	**6.2**	**0.16**	**0.66**	**46**	< 0.50	< 0.25	< 0.50	**120**	**55**
	9.5	10	09/03/09	**0.47 J**	< 0.25	**10**	**0.16**	**0.096 J**	**95**	NA	**18**	**59**	**8.3**	**0.077**	**0.13 J**	**48**	< 0.50	< 0.25	< 0.50	**56**	**57**
P6SB-05	1.5	2	09/11/09	NA	NA	NA	NA	**0.36**	**93**	NA	NA	NA	**3.7**	NA	NA	**46**	NA	NA	NA	NA	**140**
	3.5	4	09/11/09	NA	NA	NA	NA	**0.25 J**	**190**	NA	NA	NA	**0.55**	NA	NA	**67**	NA	NA	NA	NA	**140**
P6SB-06	1.5	2	09/09/09	NA	NA	NA	NA	< 0.25	**83**	NA	NA	NA	< 0.25	NA	NA	**40**	NA	NA	NA	NA	**56**
	4.5	5	09/09/09	NA	NA	NA	NA	< 0.25	**83**	NA	NA	NA	< 0.25	NA	NA	**41**	NA	NA	NA	NA	**63**
P6SB-07	4.5	5	09/09/09	NA	NA	NA	NA	< 0.25	**240**	NA	NA	NA	**12**	NA	NA	**330**	NA	NA	NA	NA	**67**
	9.5	10	09/09/09	NA	NA	NA	NA	**0.17 J**	**68**	NA	NA	NA	< 0.25	NA	NA	**44**	NA	NA	NA	NA	**240**
P6SB-08	1.5	2	09/09/09	< 0.50	**0.17 J**	**25**	**0.15**	< 0.25	**120**	NA	**25**	**69**	**0.39**	**0.15**	**0.17 J**	**77**	< 0.50	< 0.25	< 0.50	**120**	**54**
	4.5	5	09/09/09	< 0.50	< 0.25	**21**	**0.21**	< 0.25	**120**	NA	**38**	**130**	< 0.25	< 0.020	**0.15 J**	**51**	< 0.50	< 0.25	< 0.50	**160**	**68**
P6SS-11	1	1.5	12/07/09	NA	NA	NA	NA	**0.085 J**	**92**	NA	NA	NA	**13**	NA	NA	**60**	NA	NA	NA	NA	**90**
P7SB-01	1.5	2	09/10/09	NA	NA	NA	NA	< 0.25	**720**	NA	NA	NA	**0.083 J**	NA	NA	**2,100**	NA	NA	NA	NA	**26**
	4.5	5	09/10/09	NA	NA	NA	NA	< 0.25	**1,200**	NA	NA	NA	**0.45**	NA	NA	**1,200**	NA	NA	NA	NA	**16**
P7SB-02	4.5	5	09/10/09	**0.15 J**	**0.94**	**280**	**0.68**	**0.081 J**	**18**	NA	**28**	**38**	**0.45**	< 0.020	**0.21 J**	**140**	< 0.25	< 0.25	**0.056 J**	**180**	**76**
	9.5	10	09/10/09	**0.053 J**	**0.48**	**9.3**	< 0.25	**0.19 J**	**1,300**	NA	**110**	**54**	**0.42**	**0.0094 J**	**0.073 J**	**2,000**	**0.12 J**	< 0.25	**0.076 J**	**51**	**40**
P8SB-01	5	5.5	08/31/09	NA	NA	NA	NA	**0.17 J**	**110**	NA	NA	NA	**0.36**	NA	NA	**65**	NA	NA	NA	NA	**52**
	8.5	9	08/31/09	NA	NA	NA	NA	**0.19 J**	**160**	NA	NA	NA	**0.12 J**	NA	NA	**100**	NA	NA	NA	NA	**48**
	18.5	19	08/31/09	NA	NA	NA	NA	**0.20 J**	**97**	NA	NA	NA	< 0.25 UJ	NA	NA	**42**	NA	NA	NA	NA	**42**

Table 9
Metals Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
			ESL Residential	6.3	0.39	750	4	1.7	750 [1]	8	40	230	200	1.3	40	150	10	20	1.3	16	600
			ESL Commercial	40	1.6	1,500	8	7.4	750 [1]	8	80	230	750	10	40	150	10	40	16	200	600
			Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/Kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		Background Concentrations	Soil	9.05 [2]	11.5 [3]	314.4 [2]	0.71 [2]	2.2 [2]-3.14[5]	81 [4]	NA	11 [4]	124 [2]-175 [5]	8.99 [2]	2.28 [2]	2.68 [2]	50 - 2,930[5]	0.5 [4]	1.43 [2]	1 [4]	83[2]-117[5]	110[2]-423[5]
			Serpentinite Rock	12- 14[6]	0.8- 10[6]	0.9- 11.4[6]	0.5 [6]	0.5 [6]	1,300 [4]	NA	140 [4]	5- 16.6 [6]	0.2- 36.1[6]	0.1[6]- 0.2[6]	5 [6]	499- 1910[6]	5 [6]	5 [6]	1.6 - 3 [6]	5.0- 15.6[6]	20.8- 51.7[6]
Location ID	Start Depth (ft)	End Depth (ft)	Sample Date																		
P8SB-02	1	1.5	12/08/09	NA	18	NA	NA	0.29	200	NA	23	400	1,700	2.4	NA	260	NA	NA	NA	NA	350
	1.5	2	02/17/10	NA	NA	NA	NA	NA	NA	< 0.40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4.5	5	12/08/09	NA	3.3	NA	NA	0.43	75	NA	22	730	230	1.1	NA	61	NA	NA	NA	NA	780
P9SB-01	4.5	5	09/09/09	< 0.50	< 0.25	120	0.21	0.025 J	110	NA	33	150	1.2	0.058	0.15 J	92	< 0.50	< 0.25	< 0.50	150	230
	10.5	11	09/09/09	3.9	7.9	23	0.081 J	1.2	35	NA	5.8	170	180	0.14	2.2	57	< 0.50	0.62	< 0.50	15	220
P9SB-02	6.5	7	08/28/09	< 0.50	3.7	430	0.26	0.36	190	NA	25	280	46	0.15	1.1	420	< 0.50	0.23 J	< 0.50	44	230
	9.5	10	08/28/09	< 0.50	4.9	250	0.30	1.3	150	NA	19	320	36	0.028	0.43	240	< 0.50	< 0.25	0.33 J	57	270
P9SB-04	5.5	6	09/09/09	< 0.50	1.1	480	0.090 J	< 0.25	130	NA	24	98	32	0.025	0.19 J	120	< 0.50	< 0.25	< 0.50	77	120
	14.5	15	09/09/09	< 0.50	4.7	74	0.68	< 0.25	27	NA	9.3	32	9.5	0.039	0.20 J	40	< 0.50	< 0.25	< 0.50	34	83
	29.5	30	09/09/09	< 0.50	8.5	39	0.36	0.034 J	57	NA	9.9	18	4.5	0.035	0.89	54	< 0.50	0.13 J	< 0.50	44	47
P9SB-05	6	6.5	08/26/09	< 0.50	10	590	0.27	2.6	74	NA	15	1,200	2,800	7.6	1.0	160	< 0.50	< 0.25	< 0.50	130	1,900
	9.5	10	08/26/09	< 0.50	5.9	89	0.28	< 0.25	56	NA	13	36	19	0.019 J	6.5	49	< 0.50	< 0.25	1.9	58	33
P9SB-06	4	4.5	02/16/10	NA	NA	NA	NA	NA	38	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5	5.5	08/27/09	< 0.50 UJ	3.3	44	0.21	0.15 J	16	NA	4.2	15 J	50 J	0.017 J	0.44	28	< 0.50 UJ	< 0.25	< 0.50	22	38 J
	14.5	15	08/27/09	< 0.50	6.2	160	0.22	0.25 J	15	NA	12	31 J	80 J	0.20	1.2	40	< 0.50 UJ	< 0.25	< 0.50 UJ	20	50 J
	24.5	25	08/27/09	< 0.50	5.9	19	0.30	0.24 J	47	NA	9.1	15 J	5.1 J	0.029	0.73	49	< 0.50 UJ	< 0.25	< 0.50	39	45 J
P9SB-07	1	1.5	12/10/09	NA	2.6	NA	NA	1.1	250	NA	25	130	120	0.20	NA	380	NA	NA	NA	NA	170
	14.5	15	12/10/09	NA	< 0.25	NA	NA	1.0	35	NA	17	77	25	0.20	NA	34	NA	NA	NA	NA	160
P9SB-08	1	1.5	12/10/09	NA	4	NA	NA	1.1	86	NA	14	91	120	0.25	NA	130	NA	NA	NA	NA	170
	14.5	15	12/10/09	NA	< 0.25	NA	NA	0.62	85	NA	20	44	0.72	0.024	NA	48	NA	NA	NA	NA	53
P9SB-09A	1	1.5	12/10/09	NA	6.2	NA	NA	1.4	320	NA	32	140	140	0.38	NA	620	NA	NA	NA	NA	350
	7	7.5	12/10/09	NA	5.2	NA	NA	1.4	8.1	NA	7.5	890	290	1.1	NA	22	NA	NA	NA	NA	810
P9SB-09B	1	1.5	12/09/09	NA	5.3	NA	NA	1.1	150	NA	22	180	290	2.6	NA	260	NA	NA	NA	NA	170
	7	7.5	12/09/09	NA	3.3	NA	NA	0.44	48	NA	9.5	12	13	0.025	NA	48	NA	NA	NA	NA	30
P9SB-10	1	1.5	12/09/09	NA	3.3	NA	NA	0.69	190	NA	21	41	13	0.081	NA	210	NA	NA	NA	NA	50
	14	14.5	02/16/10	NA	NA	NA	NA	NA	NA	< 0.40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	14.5	15	12/09/09	NA	< 0.25	NA	NA	0.56	320	NA	34	31	4.4	0.026	NA	560	NA	NA	NA	NA	32
	19.5	20	12/09/09	NA	4	NA	NA	0.39	29	NA	8.4	17	7.1	0.025	NA	33	NA	NA	NA	NA	37
P9SB-11	7	7.5	12/17/09	NA	3.6	NA	NA	< 0.25	110	NA	16	50	15	0.25	NA	120	NA	NA	NA	NA	63
	14.5	15	02/17/10	NA	NA	NA	NA	NA	NA	< 0.40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	14.5	15	12/17/09	NA	3.6	NA	NA	< 0.25	390	NA	36	31	3.6	0.090	NA	610	NA	NA	NA	NA	39
P9SB-12	7	7.5	12/17/09	NA	< 0.25	NA	NA	0.18 J	89	NA	20	130	230	0.39	NA	53	NA	NA	NA	NA	110
	14.5	15	12/17/09	NA	5.3	NA	NA	0.28	47	NA	13	130	270	0.32	NA	32	NA	NA	NA	NA	180
P9SB-13	7	7.5	12/17/09	NA	8.6	NA	NA	0.48	120	NA	25	170	440	0.47	NA	89	NA	NA	NA	NA	250
	14.5	15	12/17/09	NA	< 0.25	NA	NA	0.12 J	99	NA	22	160	1.9	0.015 J	NA	66	NA	NA	NA	NA	89
SPSB-01	5	5.5	08/27/09	NA	NA	NA	NA	0.44	33	NA	NA	NA	15	NA	NA	25	NA	NA	NA	NA	83
	9.5	10	08/27/09	NA	NA	NA	NA	< 0.25	21	NA	NA	NA	< 0.25	NA	NA	28	NA	NA	NA	NA	54
SPSB-02	2.5	3	08/27/09	NA	NA	NA	NA	0.32	86	NA	NA	NA	140	NA	NA	110	NA	NA	NA	NA	180
	5.5	6	08/27/09	NA	NA	NA	NA	< 0.25	100	NA	NA	NA	29	NA	NA	70	NA	NA	NA	NA	130

Table 9
Metals Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
			ESL Residential	6.3	0.39	750	4	1.7	750 ^{1}	8	40	230	200	1.3	40	150	10	20	1.3	16	600
			ESL Commercial	40	1.6	1,500	8	7.4	750 ^{1}	8	80	230	750	10	40	150	10	40	16	200	600
			Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/Kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		Background Concentrations	Soil	9.05 ^{2}	11.5 ^{3}	314.4 ^{2}	0.71 ^{2}	2.2 ^{2}-3.14^5	81 ^{4}	NA	11 ^{4}	124 ^{2}-175 ^{5}	8.99 ^{2}	2.28 ^{2}	2.68 ^{2}	50 - 2,930^5	0.5 ^{4}	1.43 ^{2}	1 ^{4}	83^2-117^5	110^2-423^5
			Serpentinite Rock	12- 14^6	0.8- 10^6	0.9- 11.4^6	0.5 ^{6}	0.5 ^{6}	1,300 ^{4}	NA	140 ^{4}	5- 16.6 ^{6}	0.2- 36.1^6	0.1^6- 0.2^6	5 ^{6}	499- 1910^6	5 ^{6}	5 ^{6}	1.6 - 3 ^{6}	5.0- 15.6^6	20.8- 51.7^6
Location ID	Start Depth (ft)	End Depth (ft)	Sample Date																		
SPSB-03	5	5.5	09/08/09	NA	NA	NA	NA	0.62	460	NA	NA	NA	50	NA	NA	610	NA	NA	NA	NA	45
	9.5	10	09/08/09	NA	NA	NA	NA	0.51	70	NA	NA	NA	< 0.25	NA	NA	45	NA	NA	NA	NA	38
SPSB-04	5.5	6	08/31/09	< 0.50 UJ	9.7 J	83	0.26	0.41	90	NA	25 J	140	110	2.2	0.69	81	6.7	< 0.25	< 0.50 UJ	100	210
	14.5	15	08/31/09	< 0.50 UJ	1.5 J	8.4	0.18	< 0.25	61	NA	21 J	62	0.21 J	0.045	0.44	39	5.4	< 0.25	< 0.50	120	58
	24.5	25	08/31/09	< 0.50 UJ	5.5 J	28	0.42	0.21 J	60	NA	12 J	25	4.6	0.035	0.55	54	3.5	< 0.25	< 0.50 UJ	56	55
SPSB-05	4.5	5	09/10/09	2.3	9.5	110	0.24 J	0.24 J	23	NA	11	100	120	3.6	1.2	34	0.16 J	0.069 J	0.030 J	22	100
	9.5	10	09/10/09	0.13 J	2.9	22	0.24 J	0.62	160	NA	19	73	24	0.14	1.3	150	0.086 J	< 0.25	< 0.25	90	170
SPSS-05	1.5	2	12/17/09	NA	< 0.25	NA	NA	< 0.25	220	NA	30	92	14	< 0.020	NA	350	NA	NA	NA	NA	53
	2	2.5	02/17/10	NA	NA	NA	NA	NA	NA	< 0.40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SPSS-06	1	1.5	12/07/09	NA	NA	NA	NA	0.63	130	NA	NA	NA	430	NA	NA	26	NA	NA	NA	NA	1,100
SPSS-07	1	1.5	12/08/09	NA	3.6	NA	NA	0.19 J	79	NA	13	280	140	1.8	NA	59	NA	NA	NA	NA	240
SPSS-08	1.5	2	12/08/09	NA	7.1	NA	NA	1.1	140	NA	14	300	120	4.8	NA	100	NA	NA	NA	NA	380
SPTP-01	4.5	5	08/27/09	< 0.50	4.1	210	0.15	0.97	34	NA	3.7	100	580	0.43	0.98	20	< 0.50	0.41	< 0.50	27	410
	5.5	6	08/27/09	< 0.50	5.8	150	0.10	0.78	54	NA	6.2	140	510	0.40	2.8	31	< 0.50	< 0.25	< 0.50	17	350
SPTP-02	3.5	3.5	08/28/09	2.8	7.8	220	0.28	1.4	44	NA	5.6	220	200	1.3	3.5	27	< 0.50	5.4	< 0.50	29	350
SPTP-03	4	4	08/28/09	18	7.2	220	0.091 J	0.73	22	NA	3.1	120	290	0.21	0.23 J	18	< 0.50	0.48	< 0.50	34	360
	5.5	5.5	08/28/09	9.4	6.3	580	0.30 J	2	42	NA	4.6	120	660	1.1	1.0	29	< 0.50	3.4	< 0.50	23	760
SPTP-04	3	3	08/31/09	< 0.50	12	65	0.15	0.46	84	NA	9.7	350	170	3.3	2.5	37	3.4	0.55	< 0.50	50	710
	7	7	08/31/09	0.60	4	150	0.22	2.9	40	NA	6.8	250	340	0.74	0.62	32	1.3	4.8	< 0.50	36	1,000
SPTP-06	3.5	3.5	08/31/09	< 0.50	4.1	75	0.13	1.0	26	NA	2.1	76	120	0.55	0.59	9.1	< 0.50	1.2	0.60	10	1,700
	7	7	08/31/09	< 0.50	4.5	150	0.21	2.8	36	NA	5.8	140	140	0.14	3.1	26	< 4.6	< 0.25	< 0.50	38	1,200
TGU-16	0.5	1	11/17/09	7.9	16	220	0.24	1.6	42	NA	4.8	290	280	0.74	1.1	34	< 0.50	1.0	< 0.50	27	300
	9.5	10	11/17/09	10	16	76	0.12	1.8	250	NA	13	33	46	0.21	1.7	49	< 0.50	0.40	< 0.50	55	95
	14	14.5	11/17/09	28	53	90	0.23	2.9	680	NA	51	330	200	0.23	3.0	73	< 0.50	0.57	< 0.50	79	370
	19.5	20	11/17/09	2.2	6.1	25	0.36	0.35	52	NA	8.9	14	6.3	0.027	0.79	52	< 0.50	0.094 J	< 0.50	42	55
TGU-18	1	1.5	11/22/09	7.8	9.7	130	0.19	2.1	150	NA	17	470	270	18	3.8	100	< 0.50	0.26	< 0.50	53	1,100
	9.5	10	11/22/09	2.8	2.8	97	0.41	0.32	77	NA	16	24	13	0.12	0.34 J	71	0.48 J	0.10 J	< 0.50	58	43
	11.5	12	11/22/09	9	4.7	84	0.27	16	98	NA	19	98	68	0.77	1.5	64	< 0.50	0.24 J	< 0.50	120	42
TGU-23	1	1.5	11/20/09	1.2	27	170	0.14	0.79	110	NA	20	210	170	2.2	0.53 J	130	< 0.50	< 0.25	< 0.50	42	270
	9	9.5	11/20/09	0.58	15	35	0.11	0.65	74	NA	17	91	500	0.17	0.54 J	390	< 0.50	< 0.25	< 0.50	100	250
	13	13.5	11/20/09	2.4	17	42	0.080 J	0.83	92	NA	11	90	72	0.21	0.33 J	33	0.90	< 0.25	< 0.50	43	150

Table 9
Metals Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium VI	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
			ESL Residential	6.3	0.39	750	4	1.7	750 [1]	8	40	230	200	1.3	40	150	10	20	1.3	16	600
			ESL Commercial	40	1.6	1,500	8	7.4	750 [1]	8	80	230	750	10	40	150	10	40	16	200	600
			Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/Kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		Background Concentrations	Soil	9.05 [2]	11.5 [3]	314.4 [2]	0.71 [2]	2.2 [2]-3.14 [5]	81 [4]	NA	11 [4]	124 [2]-175 [5]	8.99 [2]	2.28 [2]	2.68 [2]	50 - 2,930 [5]	0.5 [4]	1.43 [2]	1 [4]	83 [2]-117 [5]	110 [2]-423 [5]
			Serpentinite Rock	12- 14 [6]	0.8- 10 [6]	0.9- 11.4 [6]	0.5 [6]	0.5 [6]	1,300 [4]	NA	140 [4]	5- 16.6 [6]	0.2- 36.1 [6]	0.1 [6]- 0.2 [6]	5 [6]	499- 1910 [6]	5 [6]	5 [6]	1.6 - 3 [6]	5.0- 15.6 [6]	20.8- 51.7 [6]
Location ID	Start Depth (ft)	End Depth (ft)	Sample Date																		
TGU-24	1	1.5	11/20/09	5.7	7.5	230	0.16	1.1	78	NA	6.9	660	250	11	2.8	36	0.46 J	0.58	< 0.50	25	850

Notes:
All results are reported in miligrams per kilogram (mg/kg).
Samples analyzed by EPA Method 6010/6020.
ft - feet
bgs - below ground surface
ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency, Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008.
NE - None established
< 0.005 - Not detected above the individual laboratory reporting limit
gray shading indicates result exceeds residential ESL
blue shading indicates result exceeds both residential and commercial ESLs

1 - Chromium III ESL

2 - Unless footnoted, background concentrations from *Draft Final Remedial Investigation/Feasibility Study Report for Parcel E-2, Hunters Point Shipyard, San Francisco, California* T&R. Engineering Remediation Resource Group (ERRG), February 2009.

3 - Arsenic background concentration from *Addendum - Work Plan for Additional Soil Investigation, Hoe Down Yard Pacific Gas and Electric Company, Potrero Power Plant Site, San Francisco, California* AMEC Geomatric, 9 July 2009.

4 - Background concentrations from *Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water. Presidio of San Francisco, California* Presidio Trust, October 2002. Soil background concentrations from Beach Dune Sand.

5 - Background concentrations from *Memorandum regarding Comparison of Ambient Levels of Arsenic, Cadmium, Copper, Manganese, Nickel, Vanadium, and Zinc Present at Parcel A with Four Non-HPS Sites.* T&R, 12 October 2004.

6 - Background concentrations from *Metals Concentrations in Franciscan Bedrock Outcrops, Hunters Point Shipyard, San Francisco, California.* Tetra Tech, Inc. 17 March 2004.

NA - Not analyzed

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.
* - Lithology based upon boring logs for respective sampling intervals

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Table 10
VOCs Results in Soil
Pier 70 environmental Site Investigation
San Francisco, California

			Chemical Name	1,2,4-Trimethyl-benzene	Acetone	Benzene	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Ethyl Benzene	Methyl ethyl ketone	Methylene Chloride	Naphthalene	n-Butyl-benzene	n-Propyl-benzene	p-Isopropyl-toluene	Toluene	Xylene, o-	Xylenes, Total
			ESL Residential	**NE**	**500**	**120**	**NE**	**20**	**680**	**2,300**	**13,000**	**7,200**	**1,300**	**NE**	**NE**	**NE**	**9,300**	**NE**	**11,000**
			ESL Commercial	**NE**	**500**	**270**	**NE**	**44**	**1,500**	**4,700**	**13,000**	**17,000**	**2,800**	**NE**	**NE**	**NE**	**9,300**	**NE**	**11,000**
			Unit	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
Location ID	**Start Depth (ft)**	**End Depth (ft)**	**Sample Date**																
CCSB-03	9	9.5	08/27/09	< 4.7	**30**	< 4.7	**3.2 J**	< 4.7	< 4.7	< 4.7	**4.2 J**	< 19	< 4.7 UJ	< 4.7	< 4.7	**1.3 J**	< 4.7	< 4.7	< 4.7
	14.5	15	08/28/09	< 4.4	< 18 J U	< 4.4	**1.3 J**	< 4.4	< 4.4	< 4.4	**2.2 J**	< 18	< 4.4 UJ	< 4.4	< 4.4	**1.8 J**	< 4.4	< 4.4	< 4.4
	28.5	29	08/28/09	< 4.3	< 17 J U	< 4.3	**4.5**	< 4.3	< 4.3	< 4.3	**2.7 J**	**4.0 J**	< 4.3 UJ	< 4.3	< 4.3	< 4.3	< 4.3	< 4.3	< 4.3
CPSB-01	4.5	5	09/11/09	NA	NA	< 4.7	NA	NA	NA	< 4.7	NA	NA	NA	NA	NA	NA	< 4.7	< 4.7	< 4.7
	9.5	10	09/11/09	NA	NA	< 4.9	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA	< 4.9	< 4.9	< 4.9
CPSB-03	6	6.5	08/31/09	< 4.6	**3.0 J**	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 9.2	< 18 J U	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6
	9	9.5	08/31/09	< 4.7 UJ	**9.0 J J+**	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	**2.5 J J+**	< 19 J U	< 4.7 UJ	< 4.7 UJ	< 4.7 UJ	< 4.7 UJ	< 4.7	< 4.7	< 4.7
	14	14.5	08/31/09	< 5.0	**3.1 J**	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 9.9	< 20 J U	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
P1SB-03	5	5.5	09/02/09	NA	NA	< 5.2	NA	NA	NA	< 5.2	NA	NA	NA	NA	NA	NA	< 5.2	< 5.2	< 5.2
	9.5	10	09/02/09	NA	NA	< 5.3	NA	NA	NA	< 5.3	NA	NA	NA	NA	NA	NA	< 5.3	< 5.3	< 5.3
P1SB-04	2	2.5	08/28/09	< 4.9	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.9	< 20	**1.7 J**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
	4.5	5	08/28/09	< 4.7	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
P2SB-03	1.5	2	09/02/09	< 5.0	**25**	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	**7.6 J**	< 20	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
	9.5	10	09/02/09	< 4.9	**16 J**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	**2.5 J**	< 19	< 4.9	< 4.9	< 4.9	**2.2 J**	< 4.9	< 4.9	< 4.9
P2SB-06	5.5	6	09/08/09	< 5.0	< 20	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 10	**14 J**	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
	9.5	10	09/08/09	< 4.6	**2.8 Jb**	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 9.3	**30**	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6
	19.5	20	09/08/09	< 4.8	**9.0 Jb**	< 4.8	**1.6 J**	< 4.8	< 4.8	< 4.8	< 9.6	**4.6 J**	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
P2SB-10	1	1.5	12/09/09	< 4.8	**9.2 J**	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.7	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
	7	7.5	12/09/09	< 4.7	**5.5 J**	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
P3SB-02	6	6.5	08/28/09	< 4.7	**4.7 J**	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	**5.5 Jb**	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
	10	10.5	08/28/09	< 4.9	**2.0 J**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.7	**4.1 Jb**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
	20	20.5	08/28/09	< 4.8	**11 J**	< 4.8	**3.7 J**	< 4.8	< 4.8	< 4.8	**2.6 J**	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
P4SB-01	5	5.5	09/02/09	< 4.7	**3.0 J**	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
	9.5	10	09/02/09	< 4.7	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.5	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
P4SB-05	1.5	2	09/03/09	< 4.9	**2.7 J**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.8	**5.1 J**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
	9.5	10	09/03/09	< 4.5	**5.8 J**	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 9.0	< 18	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5
P4SB-06	1.5	2	09/03/09	< 4.7	**2.5 J**	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.5	**11 J**	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
P4SB-07	1.5	2	09/03/09	< 4.9	**2.0 J**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.8	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
	4.5	5	09/03/09	< 4.6	< 18	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 9.2	< 18	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6
P4SB-08	1.5	2	09/03/09	< 4.7	**5.8 J**	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.5	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
	5	5.5	09/03/09	< 4.6	**1.9 J**	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 9.2	**6.1 J**	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6
P4SB-10	1.5	2	09/08/09	NA	NA	< 4.9	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA	< 4.9	< 4.9	< 4.9
	4.5	5	09/08/09	NA	NA	< 5.0	NA	NA	NA	< 5.0	NA	NA	NA	NA	NA	NA	< 5.0	< 5.0	< 5.0
P4SB-11	4.5	5	09/11/09	NA	NA	< 4.7	NA	NA	NA	< 4.7	NA	NA	NA	NA	NA	NA	< 4.7	< 4.7	< 4.7
	8.5	9	09/11/09	NA	NA	< 4.8	NA	NA	NA	< 4.8	NA	NA	NA	NA	NA	NA	< 4.8	< 4.8	< 4.8

Table 10
VOCs Results in Soil
Pier 70 environmental Site Investigation
San Francisco, California

			Chemical Name	1,2,4-Trimethyl-benzene	Acetone	Benzene	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Ethyl Benzene	Methyl ethyl ketone	Methylene Chloride	Naphthalene	n-Butyl-benzene	n-Propyl-benzene	p-Isopropyl-toluene	Toluene	Xylene, o-	Xylenes, Total
			ESL Residential	**NE**	**500**	**120**	**NE**	**20**	**680**	**2,300**	**13,000**	**7,200**	**1,300**	**NE**	**NE**	**NE**	**9,300**	**NE**	**11,000**
			ESL Commercial	**NE**	**500**	**270**	**NE**	**44**	**1,500**	**4,700**	**13,000**	**17,000**	**2,800**	**NE**	**NE**	**NE**	**9,300**	**NE**	**11,000**
			Unit	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
Location ID	Start Depth (ft)	End Depth (ft)	Sample Date																
P5SB-01	5	5.5	08/28/09	< 5.0	< 20	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 9.9	< 20	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
P5SB-02	1.5	2	09/08/09	**4.0 J**	**5.5 Jb**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.7	< 19	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	**1.2 J**	**2.3 J**
	4.5	5	09/08/09	< 4.9	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.9	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
P5SB-03	1.5	2	09/10/09	< 4.9	**25**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	**5.7 J**	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
	4.5	5	09/10/09	< 4.8	**11 J**	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	**2.5 J**	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
P5SB-05	1.5	2	09/10/09	< 4.9	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.8	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
	4	4.5	09/10/09	< 4.9	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.8	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
P6SB-01	5.5	6	09/09/09	< 4.6	**4.4 Jb**	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 9.3	< 19	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6
	9.5	10	09/09/09	< 4.8	**7.4 Jb**	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.5	**25**	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
	19.5	20	09/09/09	< 4.8	**21**	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	**3.8 J**	**10 J**	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
P6SB-02	1.5	2	08/27/09	< 4.9	< 19	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	**2.2 J**	**8.7 J**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
	5	5.5	08/27/09	< 5.0	**11 J**	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	**2.1 J**	**10 J**	< 5.0	< 5.0	< 5.0	< 5.0	**1.1 J**	< 5.0	< 5.0
P6SB-03	5	5.5	09/03/09	< 4.8	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.5	**7.9 J**	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
	9.5	10	09/03/09	< 4.8	**3.1 J**	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.5	**4.5 J**	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
P6SB-08	1.5	2	09/09/09	< 4.8	**4.2 J**	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.6	**2.9 J**	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
	4.5	5	09/09/09	< 4.7	**31**	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	**3.3 J**	**2.6 J**	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
P7SB-02	4.5	5	09/10/09	< 5.0	**2.7 J**	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 10	< 20	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
	9.5	10	09/10/09	< 4.7	**2.1 J**	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	**2.3 J**	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
P8SB-01	5	5.5	08/31/09	< 4.9	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.9	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
	8.5	9	08/31/09	< 4.8	**3.5 J**	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.6	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
	18.5	19	08/31/09	< 4.7	**4.8 J**	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	< 19 J U	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
P9SB-01	4.5	5	09/09/09	< 4.9	**11 J**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.8	**2.2 J**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
	10.5	11	09/09/09	< 4.9	**9.4 J**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.7	**3.0 J**	**1 J**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
P9SB-02	6.5	7	08/28/09	< 5.0	< 20	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 9.9	< 20	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
	9.5	10	08/28/09	< 4.8	**24**	< 4.8	**1.7 J**	< 4.8	< 4.8	< 4.8	**6.4 J**	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
P9SB-04	5.5	6	09/09/09	< 4.8	**2.6 J**	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.5	**4.0 J**	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
	14.5	15	09/09/09	< 50	**25 J**	< 50	< 50	< 50	< 50	< 50	< 100	**30 J**	< 50	< 50	< 50	< 50	< 50	< 50	< 50
	29.5	30	09/09/09	< 4.9	**11 J**	< 4.9	**2.8 J**	< 4.9	< 4.9	< 4.9	**2.2 J**	**3.8 J**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
P9SB-05	6	6.5	08/26/09	< 4.9	**3.2 J**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.9	**6.4 J**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
	9.5	10	08/26/09	< 17	**140**	< 17	**5.7 J**	< 17	< 17	**8.1 J**	**45**	< 66	< 17	**5.9 J**	**7.1 J**	< 17	**9.0 J**	**3.6 J**	**6.1 J**
P9SB-06	5	5.5	08/27/09	< 5.0	**27**	< 5.0	< 5.0	**4.9 J**	**4.5 J**	< 5.0	**7.4 J**	**2.0 J**	**1.2 J**	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
	14.5	15	08/27/09	< 500	< 230*	< 100*	< 100*	< 500	< 500	< 500	< 1,000	< 2,000	< 500	< 500	< 500	< 500	< 500	< 500	< 500
	24.5	25	08/27/09	< 4.8	< 19 J U	< 4.8	**3.3 J**	< 4.8	< 4.8	< 4.8	< 9.7	< 19	< 4.8 UJ	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
P9SB-11	14.5	15	12/17/09	< 4.5	**5.7 J**	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 9.1	< 18	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5
SPSB-04	5.5	6	08/31/09	< 5.0	**2.3 J J+**	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 9.9	< 20 J U	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
	14.5	15	08/31/09	< 4.7	**4.9 J**	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.3	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
	24.5	25	08/31/09	< 4.9	**7.9 J**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	**2.2 J**	< 19 J U	< 4.9	< 4.9	< 4.9	**1.6 J**	< 4.9	< 4.9	< 4.9

Table 10
VOCs Results in Soil
Pier 70 environmental Site Investigation
San Francisco, California

			Chemical Name	**1,2,4-Trimethyl-benzene**	**Acetone**	**Benzene**	**Carbon Disulfide**	**Carbon Tetrachloride**	**Chloroform**	**Ethyl Benzene**	**Methyl ethyl ketone**	**Methylene Chloride**	**Naphthalene**	**n-Butyl-benzene**	**n-Propyl-benzene**	**p-Isopropyl-toluene**	**Toluene**	**Xylene, o-**	**Xylenes, Total**
			ESL Residential	**NE**	**500**	**120**	**NE**	**20**	**680**	**2,300**	**13,000**	**7,200**	**1,300**	**NE**	**NE**	**NE**	**9,300**	**NE**	**11,000**
			ESL Commercial	**NE**	**500**	**270**	**NE**	**44**	**1,500**	**4,700**	**13,000**	**17,000**	**2,800**	**NE**	**NE**	**NE**	**9,300**	**NE**	**11,000**
			Unit	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
Location ID	**Start Depth (ft)**	**End Depth (ft)**	**Sample Date**																
SPSB-05	4.5	5	09/10/09	< 4.7	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.5	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
	9.5	10	09/10/09	< 4.9	**6.9 J**	< 4.9	**1.2 J**	< 4.9	< 4.9	< 4.9	< 9.7	< 19	**2.2 J**	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
TGU-16	19.5	20	11/17/09	**380 J**	< 450*	**270 J**	< 1,000	< 200*	< 200*	**850 J**	< 2,000	< 4,000	**86,000**	< 1,000	< 1,000	< 1,000	**440 J**	**290 J**	**770 J**

Notes:
All results are reported in micrograms per kilogram (µg/kg).
Samples analyzed by EPA Method 8260B.
ft - feet
bgs - below ground surface
VOCs - Volatile Organic Compounds
NE - None established
< 4.7 - Not detected above the individual laboratory reporting limit for each analyte
gray shading indicates result exceeds residential ESL
blue shading indicates result exceeds both residential and commercial ESLs
bold - indicates that results exceed laboratory reporting limits
* Sample reported to the method detection limit (MDL)
ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency, Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008.
-- Not analyzed
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.
Jb - The analyte was identified below the laboratory reporting limit but above the laboratory method detection limit and QAPP-specified reporting limit.
J(-) - The analyte was positively identified; the associated numerical value is biased low due to a low surrogate recovery and should be considered an approximate concentration of the analyte in the sample.
J(+) - The analyte was positively identified; the associated numerical value is biased high due to a high surrogate recovery and should be considered an approximate concentration of the analyte in the sample.
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Table 11
PCB Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	**Aroclor 1016**	**Aroclor 1221**	**Aroclor 1232**	**Aroclor 1242**	**Aroclor 1248**	**Aroclor 1254**	**Aroclor 1260**
			ESL Residential	**220**	**220**	**220**	**220**	**220**	**220**	**220**
			ESL Commercial	**740**	**740**	**740**	**740**	**740**	**740**	**740**
			Unit	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
Location ID	**Start Depth (ft)**	**End Depth (ft)**	**Sample Date**							
CCSB-03	9	9.5	08/27/09	< 12	< 24	< 12	< 12	< 12	< 12	**14**
	14.5	15	08/28/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	28.5	29	08/28/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
CPSB-03	6	6.5	08/31/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	9	9.5	08/31/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	14	14.5	08/31/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P1SB-04	2	2.5	08/28/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	4.5	5	08/28/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P2SB-03	1.5	2	09/02/09	< 12	< 24	< 12	< 12	< 12	< 12	**16**
	9.5	10	09/02/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P2SB-06	5.5	6	09/08/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	9.5	10	09/08/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	19.5	20	09/08/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P3SB-02	6	6.5	08/28/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	10	10.5	08/28/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	20	20.5	08/28/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P4SB-01	5	5.5	09/02/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	9.5	10	09/02/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P4SB-05	1.5	2	09/03/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	9.5	10	09/03/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P4SB-06	1.5	2	09/03/09	< 12	< 24	< 12	< 12	< 12	< 12	**39**
P4SB-07	1.5	2	09/03/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	4.5	5	09/03/09	< 12	< 24	< 12	< 12	< 12 UJ	< 12 UJ	**3.5 J J-**
P4SB-08	1.5	2	09/03/09	< 12	< 24	< 12	< 12	< 12	< 12	**4.3 J**
	5	5.5	09/03/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12

Table 11
PCB Results in Soil
Pier 70 Environmental Site Investigation
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			Chemical Name	**Aroclor 1016**	**Aroclor 1221**	**Aroclor 1232**	**Aroclor 1242**	**Aroclor 1248**	**Aroclor 1254**	**Aroclor 1260**
			ESL Residential	**220**	**220**	**220**	**220**	**220**	**220**	**220**
			ESL Commercial	**740**	**740**	**740**	**740**	**740**	**740**	**740**
			Unit	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
Location ID	**Start Depth (ft)**	**End Depth (ft)**	**Sample Date**							
P5SB-01	5	5.5	08/28/09	< 12	< 24	< 12	< 12	< 12	< 12	**43**
P5SB-02	1.5	2	09/08/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	4.5	5	09/08/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P5SB-03	1.5	2	09/10/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	4.5	5	09/10/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P5SB-05	1.5	2	09/10/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	4	4.5	09/10/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P6SB-01	5.5	6	09/09/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	9.5	10	09/09/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	19.5	20	09/09/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P6SB-02	1.5	2	08/27/09	< 12	< 24	< 12	< 12	< 12	< 12	**220**
	5	5.5	08/27/09	< 12	< 24	< 12	< 12	< 12	< 12	**31**
P6SB-03	5	5.5	09/03/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	9.5	10	09/03/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P6SB-08	1.5	2	09/09/09	< 12	< 24	< 12	< 12	< 12	< 12	**2.3 J**
	4.5	5	09/09/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P8SB-01	5	5.5	08/31/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	8.5	9	08/31/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	18.5	19	08/31/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P9SB-01	4.5	5	09/09/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	10.5	11	09/09/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P9SB-02	6.5	7	08/28/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	9.5	10	08/28/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P9SB-04	5.5	6	09/09/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	14.5	15	09/09/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	29.5	30	09/09/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12

Table 11
PCB Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	**Aroclor 1016**	**Aroclor 1221**	**Aroclor 1232**	**Aroclor 1242**	**Aroclor 1248**	**Aroclor 1254**	**Aroclor 1260**
			ESL Residential	**220**	**220**	**220**	**220**	**220**	**220**	**220**
			ESL Commercial	**740**	**740**	**740**	**740**	**740**	**740**	**740**
			Unit	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
Location ID	**Start Depth (ft)**	**End Depth (ft)**	**Sample Date**							
P9SB-05	6	6.5	08/26/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	9.5	10	08/26/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
P9SB-06	5	5.5	08/27/09	< 12	< 24	< 12	< 12	< 12 UJ	< 12 UJ	**39 J-**
	14.5	15	08/27/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	24.5	25	08/27/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
SPSB-04	5.5	6	08/31/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	14.5	15	08/31/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	24.5	25	08/31/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
SPSB-05	4.5	5	09/10/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12
	9.5	10	09/10/09	< 12	< 24	< 12	< 12	< 12	< 12	< 12

Notes:

All results are reported in micrograms per kilogram (µg/kg).

Samples analyzed by EPA Method 8082.

ft - feet

bgs - below ground surface

PCB - polychlorinated biphenyls

bold - indicates that results exceed laboratory reporting limits

< 12 - Not detected above the individual laboratory reporting limit for each analyte

ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency, Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008.

J(-) - The analyte was positively identified; the associated numerical value is biased low due to a low surrogate recovery and should be considered an approximate concentration of the analyte in the sample.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Table 12
Pesticides Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	4,4'-DDD	4,4'-DDE	4,4'-DDT	a-BHC	Aldrin	Alpha-Chlordane	b-BHC	d-BHC	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulfate	Endrin	Endrin Aldehyde	Gamma-Chlordane	g-BHC	Heptachlor	Heptachlor epoxide	Methoxychlor	Toxaphene
			ESL Residential	**2,400**	**1,700**	**1,700**	**NE**	**32**	**NE**	**NE**	**NE**	**2.3**	**NE**	**NE**	**NE**	**0.65**	**NE**	**NE**	**9.8**	**13**	**14**	**19,000**	**0.42**
			ESL Commercial	**10,000**	**4,000**	**4,000**	**NE**	**130**	**NE**	**NE**	**NE**	**2.3**	**NE**	**NE**	**NE**	**0.65**	**NE**	**NE**	**9.8**	**13**	**14**	**19,000**	**0.42**
			Unit	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**	**µg/kg**
Location ID	**Start Depth (ft)**	**End Depth (ft)**	**Sample Date**																				
P1SB-02	1.5	2	09/02/09	< 33	< 33	< 33	< 17	< 17	< 17	< 17	< 17	< 4.3*	< 17	< 33	< 33	< 4.9*	< 33	< 17	< 2.2*	< 2.5*	< 2.6*	< 170	< 120*
P4SB-07	1.5	2	09/03/09	< 3.3	< 3.3	< 3.3	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 0.43*	< 1.7	< 3.3	< 3.3	< 0.49*	< 3.3	< 1.7	< 1.7	< 1.7	< 1.7	< 17	< 12*
P5SB-03	1.5	2	09/10/09	< 33	< 33	< 33	< 17	< 17	< 17	**6.0 J**	< 17	< 4.3*	**7.0 J**	< 33	< 33	< 4.9*	< 33	**3.6 CJ**	< 2.2*	< 2.5*	**9.0 CJ**	< 170	< 120*
P6SB-06	1.5	2	09/09/09	< 3.3	< 3.3	< 3.3	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 0.36*	< 1.7	< 3.3	< 3.3	< 0.42*	< 3.3	< 1.7	< 1.7	< 1.7	< 1.7	< 17	< 12*
P9SB-05	2	2.5	08/26/09	< 33	< 33	< 33	< 17	< 17	< 17	< 17	< 17	< 4.3*	< 17	< 33	< 33	< 4.9*	< 33	< 17	< 2.2*	< 2.5*	< 2.6*	< 170	< 120*

Notes:
All results are reported in micrograms per kilogram (µg/kg).
Samples analyzed by EPA Method 8081.
ft - feet
bgs - below ground surface
NE - None established
< 33 - Not detected above the individual laboratory reporting limit for each analyte
* Sample reported to the method detection limit (MDL)
ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency, Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008.
C - Presence confirmed, but confirmation concentration differed by more than a factor of two.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.

Table 13
pH, Sulfide, and Total Cyanide Results in Soil
Pier 70 Environmental Site Investigation

San Francisco, California

			Chemical Name	**pH**	**Sulfide**	**Total Cyanide**
			ESL Residential	**NE**	**NE**	**0.0036**
			ESL Commercial	**NE**	**NE**	**0.0036**
			Unit	**ph units**	**mg/kg**	**mg/kg**
Location ID	**Start Depth (ft)**	**End Depth (ft)**	**Sample Date**			
CCSB-03	9	9.5	08/27/09	8.5	< 10	< 1.0
	14.5	15	08/28/09	8.1	< 10	< 1.0
	28.5	29	08/28/09	8.4	< 10	< 1.0
	6	6.5	08/31/09	6.4	< 10	< 1.0
	9	9.5	08/31/09	6.8	< 10	< 1.0
	14	14.5	08/31/09	8.1	< 10	< 1.0
P2SB-06	5.5	6	09/08/09	7.6	< 10	< 1.0
	9.5	10	09/08/09	7.8	< 10	< 1.0
	19.5	20	09/08/09	8.6	< 10	< 1.0
P3SB-02	6	6.5	08/28/09	8.3	< 10	< 1.0
	10	10.5	08/28/09	8.9	< 10	< 1.0
	20	20.5	08/28/09	9.3	< 10	< 1.0
P5SB-01	5	5.5	08/28/09	8.2	< 10	< 1.0
	5.5	6	09/09/09	7.2	< 10	< 1.0
	9.5	10	09/09/09	6.6	< 10	**1.1**
	19.5	20	09/09/09	7.8	< 10	< 1.0
P8SB-01	5	5.5	08/31/09	7.4	< 10	< 1.0
	8.5	9	08/31/09	7.5	< 10	< 1.0
	18.5	19	08/31/09	7.8	< 10	< 1.0
P9SB-04	5.5	6	09/09/09	7.5	< 10	< 1.0
	14.5	15	09/09/09	8.9	< 10	< 1.0
	29.5	30	09/09/09	8.5	< 10	< 1.0
P9SB-06	5	5.5	08/27/09	10.6	< 10	< 1.0
	14.5	15	08/27/09	8.0	< 10	< 1.0
	24.5	25	08/27/09	8.6	< 10	< 1.0
SPSB-04	5.5	6	08/31/09	8.6	< 10	< 1.0 UJ
	14.5	15	08/31/09	8.4	< 10	< 1.0 UJ
	24.5	25	08/31/09	8.4	< 10	< 1.0 UJ

Notes:

Sulfide and cyanide results are reported in miligrams per kilogram
Samples analyzed by EPA Methods 9030B and 9010C.
ft - feet
bgs - below ground surface
NE - None established
bold - indicates that results exceed laboratory reporting limits
blue shading indicates result exceeds both residential and commercial ESLs

ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency, Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Table 14
Dioxin Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	**1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)**	**1,2,3,4,6,7,8-Heptachlorodibenzo-P-Dioxin**	**1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)**	**1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)**	**1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin**	**1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)**	**1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin**	**1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)**	**1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin**	**1,2,3,7,8-Pentachlorodibenzofuran**	**1,2,3,7,8-Pentachlorodibenzo-P-Dioxin**	**2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)**	**2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)**	**2,3,7,8-Tetrachlorodibenzofuran**
			ESL Residential	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**
			ESL Commercial	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**
			Unit	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**
Location ID	**Start Depth (ft)**	**End Depth (ft)**	**Sample Date**														
P4SB-07	1.5	2	09/03/09	**1.34 J**	**3.93 J**	< 0.23	**1.01 J**	< 0.59	**0.61 J**	**0.93 J**	< 0.26	**0.98 J J**	**0.73 J**	**0.88 J**	**0.46 J**	**1.08 J**	< 1.3 UJ
P4SB-07	4.5	5	09/03/09	< 0.12	**0.37 J**	< 0.21	< 0.15	< 0.16	< 0.15	< 0.14	< 0.25	< 0.16 UJ	< 0.16	< 0.12	< 0.18	< 0.17	< 0.14 UJ
P4SB-13	1	1.5	12/16/09	< 0.58	**0.57 J**	< 0.12	**0.15 J**	< 0.12	**0.14 J**	**0.12 J**	< 0.13	**0.13 J**	**0.20 J**	**0.11 J**	< 0.12	**0.19 J**	< 0.15
P4SB-13	4.5	5	12/16/09	< 0.50	**1.10 J**	< 0.13	**0.20 J**	**0.13 J**	**0.155 J**	< 0.10	< 0.13	**0.11 J**	**0.20 J**	< 0.11	< 0.12	**0.19 J**	**0.24 J**
P4SB-14	1	1.5	12/14/09	< 3.9	**43.1**	< 0.56	**1.46 J**	< 0.31 J U	< 0.24 J U	< 0.27 J U	< 0.31	**1.61 J**	< 0.27 J U	< 0.28 J U	< 0.28 J U	< 0.28 J U	< 0.26 J U
P4SB-14	4.5	5	12/14/09	< 0.31	< 0.11 J U	**0.15 J**	< 0.18	< 0.12	< 0.10 J U	< 0.11	< 0.13	< 0.11	< 0.11 J U	< 0.12	< 0.12	< 0.11 J U	< 0.11 J U
P4SB-15	1	1.5	12/14/09	< 3.0	**44.7**	< 0.59	**0.88 J**	< 0.31 J U	< 0.25 J U	< 0.27 J U	< 0.32	**2.13 J**	< 0.28 J U	< 0.28 J U	< 0.29 J U	< 0.29 J U	< 0.26 J U
P4SB-15	4.5	5	12/14/09	< 0.21	< 0.47	< 0.17	**0.18 J**	< 0.12	< 0.099 J U	< 0.10	< 0.13	< 0.11	< 0.11 J U	< 0.12	< 0.12	< 0.11 J U	< 0.11 J U

Table 14
Dioxin Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

			Chemical Name	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	Heptachloro-dibenzofurans (HpCDF), Total	Heptachloro-dibenzo-p-dioxins (HpCDD), Total	Hexachloro-dibenzofurans (HxCDF), Total	Hexachloro-dibenzo-p-dioxins (HxCDD), Total	Octa-chlorodi-benzofuran	Octachlorodi-benzo-p-dioxin (OCDD)	Pentachlorodi-benzofurans (PeCDF), Total	Pentachlorodi-benzo-p-dioxin (PeCDD), Total	Tetrachlorodi-benzo-p-dioxins (TCDD), Total	Total TCDF
			ESL Residential	**4.5**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**
			ESL Commercial	**18**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**
			Unit	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**	**pg/g**
Location ID	**Start Depth (ft)**	**End Depth (ft)**	**Sample Date**											
P4SB-07	1.5	2	09/03/09	< 0.20	**1.34 J**	**7.32**	**5.67**	**6.80**	**1.54 J**	< 0.35 J U	**12.2**	**10.3**	**4.20 J**	< 0.20 U
P4SB-07	4.5	5	09/03/09	< 0.15	< 0.15 UJ	**0.37**	< 0.17	< 4.3	< 0.20	< 1.2	< 0.17	< 0.43	< 0.66 UJ	< 0.14
P4SB-13	1	1.5	12/16/09	**0.13 J**	< 0.65	**0.96**	**0.29**	**0.25**	**0.51 J**	**2.96 J**	**0.39**	< 0.11	**0.13**	< 0.15
P4SB-13	4.5	5	12/16/09	< 0.11	< 0.56	**2.14**	**1.60**	**0.49**	**1.14 J**	**6.82 J**	**2.24**	< 0.14	**0.14**	**0.74**
P4SB-14	1	1.5	12/14/09	< 0.27	**5.82**	**78.0**	**10.0**	**14.4**	< 0.52 J U	**237**	**14.7**	< 0.28 U	< 0.27 U	< 0.26 U
P4SB-14	4.5	5	12/14/09	< 0.11 J U	**0.55**	< 0.11 U	< 0.11 U	< 0.42	< 0.22 J U	< 0.22 J U	< 0.11 U	< 0.12	< 0.11 U	< 0.11 U
P4SB-15	1	1.5	12/14/09	< 0.27 J U	**2.81**	**79.7**	< 0.28 U	**16.9**	< 0.55 J U	**252**	**11.3**	< 0.28 U	< 0.27 U	< 0.26 U
P4SB-15	4.5	5	12/14/09	< 0.12	< 0.24	< 0.11 U	< 0.11 U	< 0.35	< 0.23 J U	< 0.21 J U	< 0.11 U	< 0.13	< 0.12	< 0.11 U

Notes:

All results are reported in picograms per gram (pg/g).
Samples analyzed by EPA Method 8260B.
ft - feet
bgs - below ground surface
NE - None established
< 0.12 - Not detected above the individual laboratory reporting limit for each analyte
bold - indicates that results exceed laboratory reporting limits

ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency, Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008.
-- Not analyzed

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Table 15
Asbestos Results in Soil
Pier 70 Environmental Site Investigation
San Francisco, California

Location ID	Start Depth (ft bgs)	End Depth (ft bgs)	Chemical Name	Asbestos	Lithology*	
			Sample Date		Weathered Serpentinite Bedrock	Serpentinite Rock Fragments in Fill Material
CCSB-03	9	9.5	08/27/09	ND		
	14.5	15	08/28/09	ND		
	6	6.5	08/31/09	ND		
	9	9.5	08/31/09	ND		
	14	14.5	08/31/09	ND		
P2SB-06	5.5	6	09/08/09	< 1% Chrysotile		**Yes**
	9.5	10	09/08/09	2% Chrysotile		**Yes**
	19.5	20	09/08/09	2% Chrysotile		**Yes**
P3SB-02	6	6.5	08/28/09	< 1% Chrysotile		
	10	10.5	08/28/09	< 1% Chrysotile		
P5SB-01	5	5.5	09/02/09	< 1% Chrysotile	**Yes**	
P6SB-01	5.5	6	09/09/09	ND		
	9.5	10	09/09/09	< 1% Chrysotile		
P8SB-01	5	5.5	08/28/09	ND		
	8.5	9	08/28/09	ND		
	18.5	19	09/08/09	ND		
P9SB-04	5.5	6	09/09/09	< 1% Chrysotile		
	14.5	15	09/09/09	ND		
P9SB-06	5	5.5	08/28/09	ND		
	24.5	25	08/28/09	ND		
SPSB-04	5.5	6	09/03/09	< 1% Chrysotile		**Yes**
	14.5	15	09/03/09	ND		**Yes**

Notes:
bgs - below ground surface
ft - feet
ND - No asbestos fibers observed in samples
< 1% Chrysotile - Some asbestos fibers observed but less than 1%
Samples analyzed by polarized light microscopy (PLM).
* - Lithology based upon boring logs for respective sampling intervals

Table 16
Soluble Metal Results in Soil
Pier 70 Environmental Investigation
San Francisco, California

				Chemical	**Chemical Name**	**Arsenic**	**Chromium**	**Copper**	**Lead**	**Nickel**	**Zinc**
				TTLC	**mg/kg**	**500**	**2,500**	**2,500**	**1,000**	**2,000**	**5,000**
				STLC	**mg/L**	**5**	**5**	**25**	**5**	**20**	**250**
				TCLP	**mg/L**	**5**	**5**	**--**	**5**	**--**	**--**
Location ID	**Start Depth**	**End Depth**	**Leachate**	**Sample Date**							
CCSB-01	5	5.5		09/02/09	mg/kg	NA	**420**	NA	**5.3**	**1,100**	**65**
	9.5	10		09/02/09	mg/kg	NA	**45**	NA	**6.4**	**44**	**43**
CCSB-02	1.5	2		09/02/09	mg/kg	NA	**100**	NA	**310**	**90**	**610**
	1.5	2	STLC	09/02/09	mg/L	NA	NA	NA	**22**	NA	NA
	1.5	2	TCLP	09/02/09	mg/L	NA	NA	NA	**0.037**	NA	NA
	9.5	10		09/02/09	mg/kg	NA	**3.4**	NA	**75**	**9.0**	**270**
CCSB-03	9	9.5		08/27/09	mg/kg	**6.0**	**45**	**17 J**	**10 J**	**48**	**43 J**
	14.5	15		08/28/09	mg/kg	**7.4**	**43**	**15 J**	**62 J**	**43**	**42 J**
	28.5	29		08/28/09	mg/kg	**4.3**	**46**	**17 J**	**4.2 J**	**47**	**45 J**
CCSB-04	1	1.5		12/14/09	mg/kg	**4.9 J**	**29**	**19**	**29 J**	**42 J**	**71 J**
	9.5	10		12/14/09	mg/kg	< 0.25 UJ	**700**	**7.6**	**3.5 J**	**1,500 J**	**1,900 J**
CCSB-05	1	1.5		12/14/09	mg/kg	**6.4 J**	**1,000**	**480**	**300 J**	**1,200 J**	**1,000 J**
	1	1.5	STLC	12/14/09	mg/L	NA	NA	NA	**NA**	**3.8**	**NA**
	9.5	10		12/14/09	mg/kg	**4.6 J**	**52**	**18**	**8.3 J**	**54 J**	**52 J**
CCSS-06	1	1.5		12/14/09	mg/kg	**4.0 J**	**80**	**160**	**290 J**	**220 J**	**430 J**
	1	1.5	STLC	12/14/09	mg/L	NA	NA	NA	**9.9**	NA	NA
CCSS-07	1	1.5		12/14/09	mg/kg	**17 J**	**210**	**390**	**420 J**	**130 J**	**660 J**
CCTP-01	1.5	2		03/24/10	mg/kg	**13**	**600**	**800**	**550**	**240**	**1,000**
CCTP-03	6.5	7		03/25/10	mg/kg	**13**	**88**	**140**	**2,200**	**96**	**850**
CPSB-01	4.5	5		09/11/09	mg/kg	NA	**8.0**	NA	**220**	**8.7**	**10**
	4.5	5	STLC	09/11/09	mg/L	NA	NA	NA	**0.73**	NA	NA
	9.5	10		09/11/09	mg/kg	NA	**37**	NA	**66**	**140**	**36**
CPSB-02	4.5	5		09/11/09	mg/kg	NA	**84**	NA	**32**	**50**	**75**
	9.5	10		09/11/09	mg/kg	NA	**79**	NA	**0.29**	**87**	**91**
CPSB-03	6	6.5		08/31/09	mg/kg	**28 J**	**39**	200	**400**	**75**	**96**
	9	9.5		08/31/09	mg/kg	**9.7 J**	**72**	68	**150**	**63**	**76**
	9	9.5	STLC	08/31/09	mg/L	NA	NA	NA	**2**	NA	NA
	14	14.5		08/31/09	mg/kg	**1.6 J**	**52**	**76**	< 0.25 UJ	**39**	**51**

Table 16
Soluble Metal Results in Soil
Pier 70 Environmental Investigation
San Francisco, California

				Chemical	**Chemical Name**	**Arsenic**	**Chromium**	**Copper**	**Lead**	**Nickel**	**Zinc**
				TTLC	**mg/kg**	**500**	**2,500**	**2,500**	**1,000**	**2,000**	**5,000**
				STLC	**mg/L**	**5**	**5**	**25**	**5**	**20**	**250**
				TCLP	**mg/L**	**5**	**5**	**--**	**5**	**--**	**--**
Location ID	**Start Depth**	**End Depth**	**Leachate**	**Sample Date**							
CPSB-04A	1	1.5		12/08/09	mg/kg	**11**	**120**	**260**	**87**	**130**	**230**
CPSB-04B	1	1.5		12/14/09	mg/kg	**4.8 J**	**73**	**73**	**37 J**	**94 J**	**120 J**
	9.5	10		12/14/09	mg/kg	**23 J**	**50**	**430**	**1,100 J**	**69 J**	**2,000 J**
P1SB-02	1.5	2		09/02/09	mg/kg	NA	**41**	NA	**83**	**38**	**130**
	9.5	10		09/02/09	mg/kg	NA	**1100**	NA	**0.63**	**1,600**	**18**
	9.5	10	STLC	09/02/09	mg/L	NA	**6.7**	NA	NA	26	NA
	9.5	10	TCLP	09/02/09	mg/L	NA	**< 0.05**	NA	NA	NA	NA
P1SB-03	5	5.5		09/02/09	mg/kg	NA	**88**	NA	**890**	**110**	**440**
	5	5.5	STLC	09/02/09	mg/L	NA	NA	NA	**130**	NA	NA
	5	5.5	TCLP	09/02/09	mg/L	NA	NA	NA	**0.11**	NA	NA
	9.5	10		09/02/09	mg/kg	NA	**250**	NA	**2.6**	**1,400**	**3,300**
	9.5	10	STLC	09/02/09	mg/L	NA	NA	NA	NA	**89**	NA
P1SB-04	2	2.5		08/28/09	mg/kg	4.0	**900**	**190**	**200**	**1,200**	**420**
	2	2.5	STLC	08/28/09	mg/L	NA	**9.6**	NA	1	44	NA
	2	2.5	TCLP	08/28/09	mg/L	NA	< 0.05	NA	NA	NA	NA
	4.5	5		08/28/09	mg/kg	< 0.25	**730**	**32**	**13**	**1,600**	**49**
	4.5	5	STLC	08/28/09	mg/L	NA	**12**	NA	NA	NA	NA
	9.5	10		08/28/09	mg/kg	NA	**920**	NA	NA	**1,600**	NA
P2SB-01	1.5	2		08/28/09	mg/kg	NA	**85**	NA	**2,800**	**140**	**710**
	1.5	2	TCLP	08/28/09	mg/L	NA	NA	NA	**0.4**	NA	NA
	9.5	10		08/28/09	mg/kg	NA	**9.9**	NA	**390**	**15**	**490**
	9.5	10	STLC	08/28/09	mg/L	NA	NA	NA	**15**	NA	NA
	9.5	10	TCLP	08/28/09	mg/L	NA	NA	NA	**0.11**	NA	NA
P2SB-03	1.5	2		09/02/09	mg/kg	**14**	**56**	**2,100**	**260**	**50**	**1,400**
	1.5	2	STLC	09/02/09	mg/L	NA	NA	NA	**14**	NA	NA
	1.5	2	TCLP	09/02/09	mg/L	NA	NA	NA	**0.47**	NA	NA
	9.5	10		09/02/09	mg/kg	**23**	**100**	**8,300**	**590**	**160**	**1,800**
	9.5	10	TCLP	09/02/09	mg/L	NA	NA	< 0.05	**2.4**	NA	NA

Table 16
Soluble Metal Results in Soil
Pier 70 Environmental Investigation
San Francisco, California

				Chemical	Chemical Name	Arsenic	Chromium	Copper	Lead	Nickel	Zinc
				TTLC	mg/kg	500	2,500	2,500	1,000	2,000	5,000
				STLC	mg/L	5	5	25	5	20	250
				TCLP	mg/L	5	5	--	5	--	--
Location ID	**Start Depth**	**End Depth**	**Leachate**	**Sample Date**							
P2SB-05	5	5.5		08/28/09	mg/kg	NA	**480**	NA	**7.7**	**1,100**	**35**
	5	5.5	STLC	08/28/09	mg/L	NA	NA	NA	NA	11	NA
	9.5	10		08/28/09	mg/kg	NA	**96**	NA	**0.23 J**	76	85
P2SB-06	5.5	6		09/08/09	mg/kg	**4.5**	**270**	**1,600**	**1,600**	**380**	**1,400**
	5.5	6	TCLP	09/08/09	mg/L	NA	NA	NA	**0.95**	NA	NA
	9.5	10		09/08/09	mg/kg	< 0.25	**790**	**11**	**1.6**	**1,200**	**15**
	9.5	10	STLC	09/08/09	mg/L	NA	NA	NA	NA	15	NA
	19.5	20		09/08/09	mg/kg	**33**	**110**	**32**	**5.5**	**100**	**51**
P2SB-07	1	1.5		12/07/09	mg/kg	NA	**22**	NA	**110**	**38**	**97**
	7	7.5		12/07/09	mg/kg	NA	**70**	NA	**480**	**74**	**810**
P2SB-08	1	1.5		12/07/09	mg/kg	NA	**68**	NA	**330**	**110**	**360**
	7	7.5		12/07/09	mg/kg	NA	**310**	NA	**390**	**390**	**1,400**
P2SB-09	1	1.5		12/07/09	mg/kg	NA	**120**	NA	**9,600**	**380**	**1,300**
	7	7.5		12/07/09	mg/kg	NA	**35**	NA	**370**	**43**	**11,000**
P2SB-10	1	1.5		12/09/09	mg/kg	**7.0**	**57**	**140**	**130**	**82**	**240**
	7	7.5		12/09/09	mg/kg	**11**	**27**	**160**	**79**	**64**	**560**
P3SB-01	1.5	2		09/02/09	mg/kg	**2.8**	**63**	**5.8**	**9.9**	**60**	**23**
	5	5.5		09/02/09	mg/kg	**4.9**	**34**	**6.3**	**200**	**27**	**110**
	5	5.5	STLC	09/02/09	mg/L	NA	NA	NA	.62	NA	NA
P3SB-02	6	6.5		08/28/09	mg/kg	**3.9**	**300**	**79**	**45**	**340**	**100**
	10	10.5		08/28/09	mg/kg	**4.1**	**380**	**35**	**200**	**710**	**92**
	10	10.5	STLC	08/28/09	mg/L	NA	NA	NA	3.5	NA	NA
	20	20.5		08/28/09	mg/kg	**2.7**	**370**	**13**	**3.5**	**380**	**26**
P4SB-01	5	5.5		09/02/09	mg/kg	**0.18 J**	**110**	**100**	**15**	**160**	**150**
	9.5	10		09/02/09	mg/kg	**7.9**	**130**	**24**	**13**	**180**	**50**
P4SB-03	1.5	2		09/03/09	mg/kg	NA	**120**	NA	**8.2**	**200**	**52**
	9.5	10		09/03/09	mg/kg	NA	**120**	NA	**5.7**	**260**	**35**
P4SB-04	5	5.5		09/03/09	mg/kg	**7.6**	**27**	**160**	**120**	**43**	**69**
	9.5	10		09/03/09	mg/kg	**2.5**	**120**	**84**	**21**	**110**	**59**

Table 16
Soluble Metal Results in Soil
Pier 70 Environmental Investigation
San Francisco, California

Location ID	Start Depth	End Depth	Leachate	Chemical	Chemical Name	Arsenic	Chromium	Copper	Lead	Nickel	Zinc
				TTLC	**mg/kg**	**500**	**2,500**	**2,500**	**1,000**	**2,000**	**5,000**
				STLC	**mg/L**	**5**	**5**	**25**	**5**	**20**	**250**
				TCLP	**mg/L**	**5**	**5**	**--**	**5**	**--**	**--**
				Sample Date							
P4SB-05	1.5	2		09/03/09	mg/kg	**1.9**	**330**	**55**	**9.3**	**590**	**51**
	9.5	10		09/03/09	mg/kg	**1.5**	**330**	**27**	**3.4**	**530**	**69**
P4SB-06	1.5	2		09/03/09	mg/kg	**3.9**	**51**	**180**	**120**	**44**	**270**
P4SB-07	1.5	2		09/03/09	mg/kg	**4.3 J**	**680**	**30**	**6.4**	**1,200**	**190 J**
	4.5	5		09/03/09	mg/kg	**1.9 J**	**630**	**24**	**5.7**	**900**	**82 J**
	4.5	5	STLC	09/03/09	mg/L	NA	**1.8**	NA	NA	17	NA
P4SB-08	1.5	2		09/03/09	mg/kg	< 0.25	**91**	**79**	**1.0**	**46**	**47**
	5	5.5		09/03/09	mg/kg	**0.10 J**	**110**	**77**	**< 0.25**	**46**	**43**
P4SB-10	1.5	2		09/08/09	mg/kg	NA	**920**	NA	**0.72**	**1,400**	**10**
	1.5	2	STLC	09/08/09	mg/L	NA	**5**	NA	NA	**85**	NA
	1.5	2	TCLP	09/08/09	mg/L	NA	NA	NA	NA	**10**	NA
	4.5	5		09/08/09	mg/kg	NA	**350**	NA	**0.85**	**1400**	**15**
P4SB-11	4.5	5		09/11/09	mg/kg	NA	**92**	NA	**0.22 J**	**41**	**32**
	8.5	9		09/11/09	mg/kg	NA	**77**	NA	**0.28**	**47**	**48**
P4SB-12	1	1.5		12/16/09	mg/kg	**33**	**51**	**2,500**	**300**	**93**	**620**
	12.5	13		12/16/09	mg/kg	< 0.25	**160**	**66**	**1.0**	**100**	**72**
P4SB-13	1	1.5		12/16/09	mg/kg	< 0.25	**83**	**49**	**0.80**	**44**	**34**
P4SB-14	1	1.5		12/14/09	mg/kg	**3.8 J**	**34**	**40**	**16 J**	**41 J**	**64 J**
P4SB-15	1	1.5		12/14/09	mg/kg	< 0.25 UJ	**89**	**57**	**16 J**	**59 J**	**86 J**
P4SB-16	1	1.5		12/16/09	mg/kg	**3.8**	**27**	**40**	**17**	**46**	**76**
	9.5	10		12/16/09	mg/kg	**3.9**	**7.1**	**14**	**21**	**13**	**27**
P4TP-AEW-01S	2.5	2.5		10/26/09	mg/kg	**8.1**	**190**	**240**	**140**	**210**	**200**
P4TP-AEW-02B	3	3		10/26/09	mg/kg	**7.7**	**25**	**75**	**56**	**36**	**200**
P4TP-AEW-03S	2.5	2.5		10/26/09	mg/kg	**11**	**61**	**390**	**450**	**78**	**1,100**
P4TP-AEW-04B	3	3		10/26/09	mg/kg	**13**	**41**	**310**	**410**	**56**	**1,100**
P5SB-01	5	5.5		08/28/09	mg/kg	**2.3**	**130**	**71**	**17**	**96**	**64**
P5SB-02	1.5	2		09/08/09	mg/kg	**4.1**	**44**	**29**	**55**	**41**	**48**
	4.5	5		09/08/09	mg/kg	< 0.25	**230**	**95**	**42**	**240**	**55**

Table 16
Soluble Metal Results in Soil
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				Chemical	**Chemical Name**	**Arsenic**	**Chromium**	**Copper**	**Lead**	**Nickel**	**Zinc**
				TTLC	**mg/kg**	**500**	**2,500**	**2,500**	**1,000**	**2,000**	**5,000**
				STLC	**mg/L**	**5**	**5**	**25**	**5**	**20**	**250**
				TCLP	**mg/L**	**5**	**5**	**--**	**5**	**--**	**--**
Location ID	**Start Depth**	**End Depth**	**Leachate**	**Sample Date**							
P5SB-03	1.5	2		09/10/09	mg/kg	**1.2**	**130**	**82**	**9.8**	**75**	**70**
	4.5	5		09/10/09	mg/kg	< 0.25	**20**	**59**	**0.068 J**	**12**	**16**
P5SB-04	1.5	2		09/10/09	mg/kg	NA	**52**	NA	**15**	**41**	**35**
	4	4.5		09/10/09	mg/kg	NA	**920**	NA	< 0.25	**1,600**	**28**
	4	4.5	STLC	09/10/09	mg/L	NA	**10**	NA	NA	**47**	NA
	4	4.5	TCLP	09/10/09	mg/L	NA	< 0.05	NA	NA	**0.76**	NA
P5SB-05	1.5	2		09/10/09	mg/kg	**0.42**	**250**	**53**	**0.13 J**	**140**	**55**
	4	4.5		09/10/09	mg/kg	**0.37**	**210**	**48**	**0.12 J**	**110**	**54**
P5SS-06	1	1.5		12/14/09	mg/kg	< 0.25 UJ	**330**	**16**	**0.69 J**	**180 J**	**47 J**
P5SS-07	1	1.5		12/08/09	mg/kg	**3.1**	**36**	**60**	**8.5**	**52**	**80**
P5SS-08	1	1.5		12/08/09	mg/kg	**1.6**	**95**	**130**	**8.7**	**59**	**57**
P6SB-01	5.5	6		09/09/09	mg/kg	**29**	**24**	**360**	**640**	**64**	**710**
	5.5	6	STLC	09/09/09	mg/L	NA	NA	**3.6**	**13**	NA	NA
	5.5	6	TCLP	09/09/09	mg/L	NA	NA	NA	**1.2**	NA	NA
	9.5	10		09/09/09	mg/kg	**660**	**27**	**96**	**12**	**28**	**71**
	19.5	20		09/09/09	mg/kg	**60**	**24**	**48**	**71**	**31**	**67**
P6SB-02	1.5	2		08/27/09	mg/kg	**3.3**	**81**	**44**	**180**	**110**	**200**
	1.5	2	STLC	08/27/09	mg/L	NA	NA	NA	**9.9**	NA	NA
	5	5.5		08/27/09	mg/kg	**2.1**	**41**	**82**	**64**	**200**	**180**
P6SB-03	5	5.5		09/03/09	mg/kg	< 0.25	**88**	**74**	**6.2**	**46**	**55**
	9.5	10		09/03/09	mg/kg	< 0.25	**95**	**59**	**8.3**	**48**	**57**
P6SB-05	1.5	2		09/11/09	mg/kg	NA	**93**	NA	**3.7**	**46**	**140**
	3.5	4		09/11/09	mg/kg	NA	**190**	NA	**0.55**	**67**	**140**
P6SB-06	1.5	2		09/09/09	mg/kg	NA	**83**	NA	< 0.25	**40**	**56**
	4.5	5		09/09/09	mg/kg	NA	**83**	NA	< 0.25	**41**	**63**
P6SB-07	4.5	5		09/09/09	mg/kg	NA	**240**	NA	**12**	**330**	**67**
	9.5	10		09/09/09	mg/kg	NA	**68**	NA	< 0.25	**44**	**240**
P6SB-08	1.5	2		09/09/09	mg/kg	**0.17 J**	**120**	**69**	**0.39**	**77**	**54**
	4.5	5		09/09/09	mg/kg	< 0.25	**120**	**130**	< 0.25	**51**	**68**
P6SS-11	1	1.5		12/07/09	mg/kg	NA	**92**	NA	**13**	**60**	**90**

Table 16
Soluble Metal Results in Soil
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San Francisco, California

Location ID	Start Depth	End Depth	Leachate	Chemical	Chemical Name	Arsenic	Chromium	Copper	Lead	Nickel	Zinc
				TTLC	**mg/kg**	**500**	**2,500**	**2,500**	**1,000**	**2,000**	**5,000**
				STLC	**mg/L**	**5**	**5**	**25**	**5**	**20**	**250**
				TCLP	**mg/L**	**5**	**5**	**--**	**5**	**--**	**--**
				Sample Date							
P7SB-01	1.5	2		09/10/09	mg/kg	NA	**720**	NA	**0.083 J**	**2100**	**26**
	1.5	2	TCLP	09/10/09	mg/L	NA	NA	NA	NA	**0.61**	NA
	4.5	5		09/10/09	mg/kg	NA	**1200**	NA	**0.45**	**1200**	16
	4.5	5	STLC	09/10/09	mg/L	NA	**5.7**	NA	NA	NA	NA
	4.5	5	TCLP	09/10/09	mg/L	NA	NA	NA	NA	2.7	NA
	9.5	10		09/10/09	mg/kg	NA	**1500**	NA	NA	NA	NA
P7SB-02	4.5	5		09/10/09	mg/kg	**0.94**	**18**	**38**	**0.45**	**140**	**76**
	9.5	10		09/10/09	mg/kg	**0.48**	**1,300**	**54**	**0.42**	**2,000**	**40**
	9.5	10	STLC	09/10/09	mg/L	NA	NA	NA	NA	11	NA
P8SB-01	5	5.5		08/31/09	mg/kg	NA	**110**	NA	**0.36**	**65**	**52**
	8.5	9		08/31/09	mg/kg	NA	**160**	NA	**0.12 J**	**100**	**48**
	18.5	19		08/31/09	mg/kg	NA	**97**	NA	< 0.25 UJ	**42**	**42**
P8SB-02	1	1.5		12/08/09	mg/kg	**18**	**200**	**400**	**1,700**	**260**	**350**
	4.5	5		12/08/09	mg/kg	**3.3**	**75**	**730**	**230**	**61**	**780**
P9SB-01	4.5	5		09/09/09	mg/kg	< 0.25	**110**	**150**	**1.2**	**92**	**230**
	10.5	11		09/09/09	mg/kg	7.9	**35**	**170**	**180**	**57**	**220**
	10.5	11	STLC	09/09/09	mg/L	NA	NA	NA	0.28	NA	NA
P9SB-02	6.5	7		08/28/09	mg/kg	**3.7**	**190**	**280**	**46**	**420**	**230**
	9.5	10		08/28/09	mg/kg	**4.9**	**150**	**320**	**36**	**240**	**270**
	9.5	10	STLC	08/28/09	mg/L	NA	NA	19	NA	NA	NA
P9SB-04	5.5	6		09/09/09	mg/kg	**1.1**	**130**	**98**	**32**	**120**	**120**
	14.5	15		09/09/09	mg/kg	**4.7**	**27**	**32**	**9.5**	**40**	**83**
	29.5	30		09/09/09	mg/kg	**8.5**	**57**	**18**	**4.5**	**54**	**47**
P9SB-05	6	6.5		08/26/09	mg/kg	**10**	**74**	**1,200**	**2,800**	**160**	**1,900**
	6	6.5	TCLP	08/26/09	mg/L	NA	NA	NA	**2.1**	NA	NA
	9.5	10		08/26/09	mg/kg	**5.9**	**56**	**36**	**19**	**49**	**33**

Table 16
Soluble Metal Results in Soil
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				Chemical	**Chemical Name**	**Arsenic**	**Chromium**	**Copper**	**Lead**	**Nickel**	**Zinc**
				TTLC	**mg/kg**	**500**	**2,500**	**2,500**	**1,000**	**2,000**	**5,000**
				STLC	**mg/L**	**5**	**5**	**25**	**5**	**20**	**250**
				TCLP	**mg/L**	**5**	**5**	**--**	**5**	**--**	**--**
Location ID	**Start Depth**	**End Depth**	**Leachate**	**Sample Date**							
P9SB-06	4	4.5		02/16/10	mg/kg	NA	**38**	NA	NA	NA	NA
	5	5.5		08/27/09	mg/kg	**3.3**	**16**	**15 J**	**50 J**	**28**	**38 J**
	5	5.5	STLC	08/27/09	mg/L	NA	NA	NA	2.2	NA	NA
	14.5	15		08/27/09	mg/kg	**6.2**	**15**	**31 J**	**80 J**	**40**	**50 J**
	24.5	25		08/27/09	mg/kg	**5.9**	**47**	**15 J**	**5.1 J**	**49**	**45 J**
P9SB-07	1	1.5		12/10/09	mg/kg	**2.6**	**250**	**130**	**120**	**380**	**170**
	14.5	15		12/10/09	mg/kg	< 0.25	**35**	**77**	**25**	**34**	**160**
P9SB-08	1	1.5		12/10/09	mg/kg	**4.0**	**86**	**91**	**120**	**130**	**170**
	14.5	15		12/10/09	mg/kg	< 0.25	**85**	**44**	**0.72**	**48**	**53**
P9SB-09A	1	1.5		12/10/09	mg/kg	**6.2**	**320**	**140**	**140**	**620**	**350**
	7	7.5		12/10/09	mg/kg	**5.2**	**8.1**	**890**	**290**	**22**	**810**
P9SB-09B	1	1.5		12/09/09	mg/kg	**5.3**	**150**	**180**	**290**	**260**	**170**
	7	7.5		12/09/09	mg/kg	**3.3**	**48**	**12**	**13**	**48**	**30**
P9SB-10	1	1.5		12/09/09	mg/kg	**3.3**	**190**	**41**	**13**	**210**	**50**
	14.5	15		12/09/09	mg/kg	< 0.25	**320**	**31**	**4.4**	**560**	**32**
	19.5	20		12/09/09	mg/kg	**4.0**	**29**	**17**	**7.1**	**33**	**37**
P9SB-11	7	7.5		12/17/09	mg/kg	**3.6**	**110**	**50**	**15**	**120**	**63**
	14.5	15		12/17/09	mg/kg	**3.6**	**390**	**31**	**3.6**	**610**	**39**
P9SB-12	7	7.5		12/17/09	mg/kg	< 0.25	**89**	**130**	**230**	**53**	**110**
	14.5	15		12/17/09	mg/kg	**5.3**	**47**	**130**	**270**	**32**	**180**
P9SB-13	7	7.5		12/17/09	mg/kg	**8.6**	**120**	**170**	**440**	**89**	**250**
	14.5	15		12/17/09	mg/kg	< 0.25	**99**	**160**	**1.9**	**66**	**89**
SPSB-01	5	5.5		08/27/09	mg/kg	NA	**33**	NA	**15**	**25**	**83**
	9.5	10		08/27/09	mg/kg	NA	**21**	NA	< 0.25	**28**	**54**
SPSB-02	2.5	3		08/27/09	mg/kg	NA	**86**	NA	**140**	**110**	**180**
	5.5	6		08/27/09	mg/kg	NA	**100**	NA	**29**	**70**	**130**
SPSB-03	5	5.5		09/08/09	mg/kg	NA	**460**	NA	**50**	**610**	**45**
	9.5	10		09/08/09	mg/kg	NA	**70**	NA	< 0.25	**45**	**38**

Table 16
Soluble Metal Results in Soil
Pier 70 Environmental Investigation
San Francisco, California

				Chemical	Chemical Name	Arsenic	Chromium	Copper	Lead	Nickel	Zinc
				TTLC	mg/kg	500	2,500	2,500	1,000	2,000	5,000
				STLC	mg/L	5	5	25	5	20	250
				TCLP	mg/L	5	5	--	5	--	--
Location ID	Start Depth	End Depth	Leachate	Sample Date							
SPSB-04	5.5	6		08/31/09	mg/kg	**9.7 J**	**90**	**140**	**110**	**81**	**210**
	5.5	6	STLC	08/31/09	mg/L	NA	NA	NA	8.1	NA	NA
	14.5	15		08/31/09	mg/kg	**1.5 J**	**61**	**62**	**0.21 J**	**39**	**58**
	24.5	25		08/31/09	mg/kg	**5.5 J**	**60**	**25**	**4.6**	**54**	**55**
SPSB-05	4.5	5		09/10/09	mg/kg	**9.5**	**23**	**100**	**120**	**34**	**100**
	9.5	10		09/10/09	mg/kg	**2.9**	**160**	**73**	**24**	**150**	**170**
SPSS-05	1.5	2		12/17/09	mg/kg	< 0.25	**220**	**92**	**14**	**350**	**53**
SPSS-06	1	1.5		12/07/09	mg/kg	NA	**130**	NA	**430**	**26**	**1,100**
SPSS-07	1	1.5		12/08/09	mg/kg	**3.6**	**79**	**280**	**140**	**59**	**240**
SPSS-08	1.5	2		12/08/09	mg/kg	**7.1**	**140**	**300**	**120**	**100**	**380**
SPTP-01	4.5	5		08/27/09	mg/kg	**4.1**	**34**	**100**	**580**	**20**	**410**
	5.5	6		08/27/09	mg/kg	**5.8**	**54**	**140**	**510**	**31**	**350**
	5.5	6	STLC	08/27/09	mg/L	NA	NA	NA	**29**	NA	NA
	5.5	6	TCLP	08/27/09	mg/L	NA	NA	NA	**0.14**	NA	NA
SPTP-02	3.5	3.5		08/28/09	mg/kg	**7.8**	**44**	**220**	**200**	**27**	**350**
	3.5	3.5	STLC	08/28/09	mg/L	NA	NA	NA	2.4	NA	NA
SPTP-03	4	4		08/28/09	mg/kg	**7.2**	**22**	**120**	**290**	**18**	**360**
	5.5	5.5		08/28/09	mg/kg	**6.3**	**42**	**120**	**660**	**29**	**760**
	5.5	5.5	STLC	08/28/09	mg/L	NA	NA	NA	6	NA	NA
	5.5	5.5	TCLP	08/28/09	mg/L	NA	NA	NA	0.073	NA	NA
SPTP-04	3	3		08/31/09	mg/kg	**12**	**84**	**350**	**170**	**37**	**710**
	6.5	7	STLC	08/31/09	mg/L	NA	NA	NA	**32**	NA	NA
	6.5	7	TCLP	08/31/09	mg/L	NA	NA	NA	**0.075**	NA	NA
	7	7		08/31/09	mg/kg	**4.0**	**40**	**250**	**340**	**32**	**1,000**
SPTP-06	3.5	3.5		08/31/09	mg/kg	**4.1**	**26**	**76**	**120**	**9.1**	**1,700**
	7	7		08/31/09	mg/kg	**4.5**	**36**	**140**	**140**	**26**	**1,200**
	7	7	STLC	08/31/09	mg/L	NA	NA	NA	1.6	NA	NA

Table 16
Soluble Metal Results in Soil
Pier 70 Environmental Investigation
San Francisco, California

				Chemical	Chemical Name	Arsenic	Chromium	Copper	Lead	Nickel	Zinc
				TTLC	**mg/kg**	**500**	**2,500**	**2,500**	**1,000**	**2,000**	**5,000**
				STLC	**mg/L**	**5**	**5**	**25**	**5**	**20**	**250**
				TCLP	**mg/L**	**5**	**5**	**--**	**5**	**--**	**--**
Location ID	**Start Depth**	**End Depth**	**Leachate**	**Sample Date**							
TGU-16	0.5	1		11/17/09	mg/kg	**16**	**42**	**290**	**280**	**34**	**300**
	9.5	10		11/17/09	mg/kg	**16**	**250**	**33**	**46**	**49**	**95**
	14	14.5		11/17/09	mg/kg	**53**	**680**	**330**	**200**	**73**	**370**
	19.5	20		11/17/09	mg/kg	**6.1**	**52**	**14**	**6.3**	**52**	**55**
TGU-18	1	1.5		11/22/09	mg/kg	**9.7**	**150**	**470**	**270**	**100**	**1,100**
	9.5	10		11/22/09	mg/kg	**2.8**	**77**	**24**	**13**	**71**	**43**
	11.5	12		11/22/09	mg/kg	**4.7**	**98**	**98**	**68**	**64**	**42**
TGU-23	1	1.5		11/20/09	mg/kg	**27**	**110**	**210**	**170**	**130**	**270**
	9	9.5		11/20/09	mg/kg	**15**	**74**	**91**	**500**	**390**	**250**
	13	13.5		11/20/09	mg/kg	**17**	**92**	**90**	**72**	**33**	**150**
TGU-24	1	1.5		11/20/09	mg/kg	**7.5**	**78**	**660**	**250**	**36**	**850**

Notes:
mg/L - milligrams per Liter
mg/kg - milligrams per kilogram
Samples analyzed by California Waste Extraction Test (WET).
TTLC Total Threshold Limit Concentration -State Hazardous Waste Criterion
STLC Soluble Threshold Limit Concentration State Hazardous Waste Criterion
TCLP - Toxicity Characterisitic Leaching Potential - Federal Hazardous Waste Criterior
gray shading indicates results exceed TTLC
blue shading indicates results exceed STLC
orange shading indicates result exceed TCLP
NA - not analyzed
-- - not applicable
bold - indicates that results exceed laboratory reporting limits.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Table 17
TPH Results in Groundwater
Pier 70 Environmental Site Investigation
San Francisco, California

		Chemical Name	TPHg	TPHd	TPHmo
		ESL	210	210	210
		Unit	µg/L	µg/L	µg/L
Sample Name	**Location ID**	**Sample Date**			
CCSB-03GW(13)	CCSB-03	08/28/09	**82 Y**	**880 Y**	**610**
CCSB-04GW(15)	CCSB-04	12/14/09	< 50 J U	**990**	**1,100**
CPSB-01GW(15)	CPSB-01	09/11/09	**75 Y**	**410 Y**	**440**
CPSB-04GW(15)	CPSB-04B	12/14/09	< 50 J U	**8,200**	**8,200**
P2SB02-GW(15)	P2SB-02	08/26/09	**28 J**	**12 J**	< 82*
P2SB04-GW(15)	P2SB-04	08/26/09	**13 J**	< 50	< 82*
DUP1-2009-09-08	P2SB-06	09/08/09	**25 J**	< 50	< 82*
P2SB-06GW(17)	P2SB-06	09/08/09	**30 J**	< 50	< 81*
P2SB-10GW(15)	P2SB-10	12/09/09	**15 J**	**47 J**	**67 J**
P3SB-02GW(20)	P3SB-02	08/28/09	< 50	**120 Y**	< 81*
P4SB-12GW(13)	P4SB-12	12/16/09	**27 J**	**160**	**51 J**
P6SB-01GW(17)	P6SB-01	09/09/09	**31 J**	< 50	< 82*
DUP1-2009-09-09	P6SB-01	09/09/09	**28 J**	< 50	< 82*
P6SB-02GW(15)	P6SB-02	08/27/09	**15 J**	< 50	< 81*
P8SB-01GW(28)	P8SB-01	08/31/09	**13 J**	**11 J**	< 63*
P9SB-04GW(15)	P9SB-04	09/09/09	**6,600 Y**	**85,000 Y**	**66,000**
P9SB-06GW(17)	P9SB-06	08/27/09	**3,300 Y**	**120,000 Y**	**98,000**
P9SB-07GW(20)	P9SB-07	12/10/09	**970 Y**	**2,200**	**1,500**
DUP1-2009-12-10	P9SB-07	12/10/09	**470 Y**	**120,000**	**96,000**
P9SB-09AGW(15)	P9SB-09A	12/10/09	**7,000 Y**	**11,000**	**2,600**
P9SB-09BGW(15)	P9SB-09B	12/09/09	**18 J**	**560**	**470**
P9SB-10GW(20)	P9SB-10	12/09/09	**480 Y**	**13,000**	**12,000**
P9SB-11GW(17)	P9SB-11	12/17/09	**1,900 Y**	**120,000**	**85,000**
P9SB-12GW(20)	P9SB-12	12/17/09	**29 J**	**1,200**	**1,100**
P9SB-13GW(20)	P9SB-13	12/17/09	**720 Y**	**180,000**	**150,000**
SPSB-04GW(17)	SPSB-04	08/31/09	**9.6 J**	**36 J**	< 63*
SPTP-05GW(8.0)	SPTP-05	08/31/09	**NA**	< 50	< 84*

Notes:

All results are reported in micrograms per Liter (µg/L).

TPHg - Total Petroleum Hydrocarbons as Gasoline Range (C7-C12), EPA Method 8015M

TPHd - Total Petroleum Hydrocarbons as Diesel Range (C10-C24), EPA Method 8015M

TPHmo - Total Petroleum Hydrocarbons as Motor Oil (C24-C36), EPA Method 8015M

bold - indicates that results exceed laboratory reporting limits

gray shading indicates result exceeds ESL

DUP - duplicate sample

NA - not analyzed

< 50 - Not detected above the individual laboratory reporting limit for each analyte

* Sample reported to the method detection limit (MDL)

ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008, Table B - Groundwater.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.

U - The analyte was analyzed for, but was not detected above, the reported sample quantitation limit.

Y - Sample exhibits a fuel pattern, which does not resemble standard.

Table 18
PAH Results in Groundwater
Pier 70 Environmental Site Investigation
San Francisco, California

Sample Name	Location ID	Chemical Name	Acenaph-thene	Acenaph-thylene	Anthracene	Benzo (a) anthracene	Benzo (a) pyrene	Benzo (b) fluoranthene	Benzo (g,h,i) perylene	Benzo (k) fluoranthene	Chrysene	Dibenzo (a,h) anthracene	Fluoran thene	Fluorene	Indeno (1,2,3-cd) pyrene	Naphthalene	Phenan-threne	Pyrene
		ESL	23	30	0.73	0.027	0.014	0.029	0.1	0.4	0.35	0.25	8	3.9	0.048	24	4.6	2
		Unit	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
		Sample Date																
CCSB-03GW(13)	CCSB-03	08/28/09	**0.5**	**0.09 J**	**0.1**	**0.06 J**	**0.04 J**	**0.05 J**	< 0.02*	**0.03 J**	**0.1**	< 0.1	**0.2**	**0.5**	< 0.02*	**0.1 J**	**0.9**	**0.3**
CCSB-04GW(15)	CCSB-04	12/14/09	**0.05 J**	**0.03 J**	**0.06 J**	**0.1**	**0.1**	**0.2**	**0.1**	**0.05 J**	**0.2**	**0.03 J**	**0.2**	**0.09 J**	**0.09 J**	**0.1**	**0.3**	**0.3**
CPSB-01GW(15)	CPSB-01	09/11/09	**0.09**	**0.1**	**0.3**	**0.5**	**0.5**	**0.5**	**0.2**	**0.2**	**0.6**	**0.05 J**	**0.8**	**0.1**	**0.2**	**0.3**	**0.4**	**0.8**
CPSB-04GW(15)	CPSB-04B	12/14/09	**0.5**	**0.1 J**	**0.3**	**0.2**	**0.3**	**0.3**	**0.3**	**0.09 J**	**0.6**	< 0.2	**0.4**	**0.4**	**0.3**	**0.9**	**0.5**	**0.7**
P2SB02-GW(15)	P2SB-02	08/26/09	< 0.1	< 0.1	< 0.1	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.1	< 0.1	< 0.1	**0.03 J**	**0.04 J**	< 0.02*	< 0.1	**0.03 J**	**0.03 J**
P2SB04-GW(15)	P2SB-04	08/26/09	< 0.1	< 0.1	**0.02 J**	< 0.02*	< 0.02*	**0.03 J**	**0.02 J**	< 0.1	**0.03 J**	< 0.1	**0.05 J**	**0.06 J**	< 0.02*	**0.03 J**	**0.07 J**	**0.05 J**
P2SB-06GW(17)	P2SB-06	09/08/09	< 0.1	< 0.1	< 0.1	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.02*	< 0.1	< 0.1	< 0.1
DUP1-2009-09-08	P2SB-06	09/08/09	< 0.09	< 0.09	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.02*	< 0.09	< 0.09	< 0.09
P2SB-10GW(15)	P2SB-10	12/09/09	**0.3**	**0.4**	**0.6**	**0.9**	**1.2**	**1.1**	**0.8**	**0.3**	**1**	**0.3**	**1.4**	**0.4**	**0.6**	**0.9**	**1.4**	**2.2**
P3SB-02GW(20)	P3SB-02	08/28/09	**0.2**	**0.1**	**0.3**	**0.3**	**0.3**	**0.4**	**0.2**	**0.1**	**0.4**	**0.06 J**	**0.9**	**0.4**	**0.2**	**0.4**	**0.9**	**0.8**
P4SB-12GW(13)	P4SB-12	12/16/09	< 0.09	**0.05 J**	**0.04 J**	**0.2**	**0.2**	**0.2**	**0.09 J**	**0.09 J**	**0.2**	**0.02 J**	**0.3**	< 0.09	**0.08 J**	**0.1**	**0.2**	**0.3**
P6SB-01GW(17)	P6SB-01	09/09/09	< 0.09	< 0.09	**0.02 J**	**0.06 J**	**0.07 J**	**0.09 J**	**0.06 J**	**0.03 J**	**0.08 J**	< 0.09	**0.1**	< 0.09	**0.05 J**	**0.04 J**	**0.1**	**0.1**
DUP1-2009-09-09	P6SB-01	09/09/09	< 0.1	**0.02 J**	**0.03 J**	**0.08 J**	**0.09 J**	**0.1**	**0.07 J**	**0.04 J**	**0.1**	**0.02 J**	**0.1**	**0.02 J**	**0.06 J**	**0.04 J**	**0.2**	**0.2**
P6SB-02GW(15)	P6SB-02	08/27/09	< 0.1	**0.05 J**	**0.07 J**	**0.1**	**0.1**	**0.1**	**0.09 J**	**0.05 J**	**0.1**	< 0.1	**0.2**	< 0.1	**0.07 J**	**0.05 J**	**0.2**	**0.3**
P8SB-01GW(28)	P8SB-01	08/31/09	< 0.1	**0.03 J**	**0.06 J**	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.02*	< 0.1	< 0.1	**0.05 J**
P9SB-04GW(15)	P9SB-04	09/09/09	**5.3**	< 4.7	< 4.7	**4.2 J**	< 0.9*	**3.1 J**	**1.1 J**	< 0.9*	**13**	< 1.0*	**2.6 J**	< 0.9*	< 0.9*	< 4.7	< 0.9*	**6**
P9SB-06GW(17)	P9SB-06	08/27/09	**8.2 J**	**4.1 J**	**7.3 J**	**7.5 J**	< 2.0*	**8.6 J**	**3.8 J**	**2.5 J**	**17**	< 2.0*	**15**	**7.2 J**	< 2.0*	**7.6 J**	**23**	**17**
P9SB-07GW(20)	P9SB-07	12/10/09	< 0.3	< 0.3	< 0.3	< 0.06*	< 0.06*	**0.08 J**	**0.07 J**	< 0.3	< 0.3	< 0.06*	**0.08 J**	< 0.3	< 0.06*	< 0.3	< 0.3	**0.3 J**
DUP1-2009-12-10	P9SB-07	12/10/09	< 0.1	< 0.1	< 0.1	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.02*	< 0.1	< 0.1	**0.04 J**
P9SB-09AGW(15)	P9SB-09A	12/10/09	< 0.7	< 0.7	< 0.7	**0.5 J**	**0.7**	**0.9**	**0.5 J**	< 0.1*	**1**	**0.2 J**	**1**	**0.9**	**0.4 J**	**26**	**1.7**	**1.9**
P9SB-09BGW(15)	P9SB-09B	12/09/09	**0.7**	**0.5**	**0.9**	**1.7**	**1.9**	**2**	**1.3**	**0.7**	**2**	**0.3**	**4.2**	**0.8**	**1.1**	**1.7**	**4.8**	**5.2**
P9SB-10GW(20)	P9SB-10	12/09/09	**1.8**	< 1	< 1	< 0.2*	< 0.2*	< 0.2*	< 0.2*	< 1	**1.8**	< 1	< 1	< 1	< 0.2*	< 1	**2.5**	**1.4**
P9SB-11GW(17)	P9SB-11	12/17/09	**6.4**	< 4.8	< 4.8	< 1.0*	< 1.0*	**2.2 J**	< 1.0*	< 1.0*	**11**	< 1.0*	**4.3 J**	< 1.0*	< 1.0*	< 4.8	**15**	**9.2**
P9SB-12GW(20)	P9SB-12	12/17/09	**6.0**	**2.9**	**3.1**	**3.3**	**2.8**	**2.9**	**1.5**	**1.4**	**3.4**	**0.4 J**	**8.7**	**6.9**	**1.4**	**7.9**	**15**	**7.8**
P9SB-13GW(20)	P9SB-13	12/17/09	< 9.6	< 9.6	< 1.9*	< 1.9*	< 1.9*	**3.1 J**	< 1.9*	< 1.9*	**5.3 J**	< 1.9*	< 1.9*	< 1.9*	< 1.9*	< 9.6	< 1.9*	**8.4 J**
SPSB-04GW(17)	SPSB-04	08/31/09	< 0.3	**0.1 J**	**0.1 J**	**0.6**	**0.7**	**0.9**	**0.4**	**0.3**	**0.6**	**0.1 J**	**0.8**	**0.06 J**	**0.4**	**0.2 J**	**0.4**	**0.8**
SPTP-05GW(8.0)	SPTP-05	08/31/09	< 0.1	< 0.1	< 0.1	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.02*	< 0.1	< 0.1	< 0.1

Notes:
All results are reported in micrograms per Liter (µg/L).
Samples analyzed using EPA Method 8260.
SVOCs - Semi Volatile Organic Compounds, EPA 8260B
< 0.1 - Not detected above the individual laboratory reporting limit for each analyte
NA - Not analyzed
bold - indicates that results exceed laboratory reporting limits
gray shading indicates result exceeds ESL
DUP - duplicate sample
* Sample reported to the method detection limit (MDL)

ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008, Table B - Groundwater.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.

Table 19
Dissolved Metals Results in Groundwater
Pier 70 Environmental Site Investigation
San Francisco, California

		Chemical Name	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Cadmium**	**Chromium**	**Cobalt**	**Copper**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Vanadium**	**Zinc**
		ESL	**30**	**36**	**1,000**	**0.53**	**0.25**	**180**	**3**	**3.1**	**2.5**	**0.025**	**240**	**8.2**	**5**	**0.19**	**4**	**19**	**81**
		Unit	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**
Sample Name	**Location ID**	**Sample Date**																	
CCSB-03GW(13)	CCSB-03	08/28/09	**3.2 J**	< 5.0	**74 J**	< 2.0	< 1.3*	< 5.0	**1.4 J**	**3.5 J**	**37 J**	< 0.038*	< 5.0	**2.6 J**	**3.4 J**	< 0.93*	< 2.7*	**3.9 J**	< 20
CCSB-04GW(15)	CCSB-04	12/14/09	NA	**15**	NA	NA	< 1.4*	**4.5 J**	**77**	**3.9 J**	< 1.0* UJ	< 0.015*	NA	**61**	NA	NA	NA	NA	**100**
CPSB-01GW(15)	CPSB-01	09/11/09	NA	NA	NA	NA	< 1.4*	**1.0 J**	NA	NA	**1.2 J**	NA	NA	**31**	NA	NA	NA	NA	**83**
P2SB02-GW(15)	P2SB-02	08/26/09	NA	NA	NA	NA	< 1.3*	< 5.0	NA	NA	< 0.61*	NA	NA	**11**	NA	NA	NA	NA	**24**
P2SB04-GW(15)	P2SB-04	08/26/09	NA	NA	NA	NA	< 1.3*	< 5.0	NA	NA	**0.82 J**	NA	NA	**16**	NA	NA	NA	NA	**18 J**
P2SB-06GW(17)	P2SB-06	09/08/09	< 10	**2.3 J**	**120**	**0.62 J**	< 1.4*	< 5.0	**4.4 J**	**10**	< 1.0*	< 0.038*	**14**	**31**	**8.7 J**	**5.0 J**	< 2.6*	**2.7 J**	**19 J**
DUP1-2009-09-08	P2SB-06	09/08/09	< 10	**2.9 J**	**110**	**0.35 J**	< 1.4*	**1.6 J**	**5.4**	**8.9**	< 1.0*	< 0.038*	**11**	**33**	**5.9 J**	**3.2 J**	< 2.6*	**3.0 J**	**14 J**
P2SB-10GW(15)	P2SB-10	12/09/09	NA	**4.3 J**	NA	NA	< 0.048*	< 5.0	**1.4 J**	< 0.096*	< 0.07*	< 0.0057*	NA	**4.9 J**	NA	NA	NA	NA	**6.8 J**
P3SB-02GW(20)	P3SB-02	08/28/09	< 10	< 5.0 J U	**100 J**	< 2.0	< 1.3*	< 5.0	**16**	< 1.4*	< 0.61* UJ	< 0.038*	**5.1**	**27**	< 3.0*	< 0.93*	< 2.7*	**2.8 J**	< 20
P6SB-01GW(17)	P6SB-01	09/09/09	< 10	< 5.0	**120**	< 2.0	< 1.3*	< 5.0	**4.7 J**	**2.3 J**	**0.76 J**	< 0.038*	**2.7 J**	**8.7**	< 3.0*	< 0.93*	< 2.7*	< 5.0	**42**
DUP1-2009-09-09	P6SB-01	09/09/09	< 10	< 5.0	**110**	< 2.0	< 1.3*	< 5.0	**4.7 J**	**3.3 J**	**1.3 J**	< 0.038*	**4.2 J**	**8.5**	< 3.0*	< 0.93*	< 2.7*	< 5.0	**66**
P6SB-02GW(15)	P6SB-02	08/27/09	**8.2 J**	**19**	**100**	< 2.0	< 1.3*	< 5.0	**1.9 J**	< 5.0	**1.8 J**	**0.17 J**	**52**	**5.9**	< 3.0*	< 0.93*	< 2.7*	**15**	< 20
P8SB-01GW(28)	P8SB-01	08/31/09	< 10	< 5.0	**47**	< 2.0	< 1.3*	< 5.0	**1.9 J**	**3.2 J**	**3.9**	< 0.038*	< 5.0	**4.1 J**	< 3.0*	< 0.93*	< 2.7*	**1.2 J**	**8.4 J**
P9SB-04GW(15)	P9SB-04	09/09/09	< 10	< 5.0	**1,200**	< 2.0	< 1.3*	< 5.0	< 1.1*	**2.9 J**	**1.3 J**	< 0.038*	< 5.0	< 5.0	< 3.0*	< 0.93*	< 2.7*	< 5.0	**7.8 J**
P9SB-06GW(17)	P9SB-06	08/27/09	< 10	**1.9 J**	**620**	< 2.0	< 1.3*	< 5.0	**3.7 J**	**1.8 J**	**2.7 J**	< 0.033*	**3.9 J**	**10**	< 3.0*	< 0.93*	< 2.7*	**0.72 J**	< 20
P9SB-07GW(20)	P9SB-07	12/10/09	NA	**9.6**	NA	NA	< 1.4*	**2.9 J**	**3.2 J**	**5.9**	< 1.0*	< 0.015*	NA	**5.0**	NA	NA	NA	NA	< 20
DUP1-2009-12-10	P9SB-07	12/10/09	NA	**8.3**	NA	NA	< 1.4*	**2.7 J**	**2.7 J**	**6.3**	< 1.0*	< 0.015*	NA	**5.1**	NA	NA	NA	NA	< 20
P9SB-09AGW(15)	P9SB-09A	12/10/09	NA	**8.0**	NA	NA	**16**	**7.0**	**59**	**26**	< 1.0*	< 0.015*	NA	**69**	NA	NA	NA	NA	**3,100**
P9SB-09BGW(15)	P9SB-09B	12/09/09	NA	**7.7**	NA	NA	< 1.3*	**1.6 J**	**7.9**	**8.1**	< 1.0*	< 0.033*	NA	**7.9**	NA	NA	NA	NA	**23**
P9SB-10GW(20)	P9SB-10	12/09/09	NA	**14**	NA	NA	< 1.3*	< 5.0	**6.8**	**4.1 J**	< 1.0*	< 0.033*	NA	**32**	NA	NA	NA	NA	**12 J**
SPSB-04GW(17)	SPSB-04	08/31/09	< 10	**11**	**190**	< 2.0	< 1.3*	< 5.0	**16**	**6.7**	**7.7**	< 0.038*	**11**	**12**	< 3.0*	< 0.93*	**3.6 J**	< 5.0	**15 J**
SPTP-05GW(8.0)	SPTP-05	08/31/09	< 10	**9.8**	**73**	< 2.0	< 1.3*	< 5.0	< 1.1*	**5.3**	**5.8**	< 0.038*	**3.2 J**	**9.3**	< 3.0*	< 0.93*	< 2.7*	< 5.0	**7.7 J**

Notes:

All results are reported in micrograms per Liter (µg/L).

Samples analyzed using EPA Method 6010.

gray shading indicates result exceeds ESL

bold - indicates that results exceed laboratory reporting limits

DUP - duplicate sample

NA - Not analyzed

< 10 - Not detected above the individual laboratory reporting limit for each analyte

* Sample reported to the method detection limit (MDL)

ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.

Table 20
VOC Results in Groundwater
Pier 70 Environmental Site Investigation
San Francisco, California

		Chemical Name	1,2,4-Trimethyl-benzene	Acetone	Benzene	Bromo-benzene	Carbon Disulfide	Chloroform	Chlorom-ethane	Cumene	Ethyl Benzene	Methylene Chloride	Methyl-t-butyl-ether	Naphth-alene	Propyl-benzene	para-Isopropyl-toluene	sec-Butyl-benzene	tert-Butyl-benzene	Toluene	Xylene, o-	Xylenes, Total	All Other VOCs
		ESL		**1,500**	**46**	**NE**	**NE**	**330**	**41**	**NE**	**43**	**2,200**	**1,800**	**24**	**NE**	**NE**	**NE**	**NE**	**130**	**NE**	**100**	**NE**
		Unit	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**
Sample Name	**Location ID**	**Sample Date**																				
CCSB-03GW(13)	CCSB-03	08/28/09	< 0.5	< 10 U	< 0.5	< 0.5	**0.1 J**	< 0.5	< 1.0	< 0.5	< 0.5	< 10	< 0.5	< 2.0	< 0.5	**0.3 J**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
CPSB-01GW(15)	CPSB-01	09/11/09	NA	NA	< 0.5	NA	NA	NA	NA	NA	< 0.5	NA	< 0.5	NA	NA	NA	NA	NA	< 0.5	< 0.5	< 0.5	ND
P2SB02-GW(15)	P2SB-02	08/26/09	NA	NA	< 0.50	NA	NA	NA	NA	NA	< 0.50	NA	< 2.0	NA	NA	NA	NA	NA	**0.18 J**	**0.19 CJ**	**0.27 J**	ND
P2SB-06GW(17)	P2SB-06	09/08/09	< 0.5	< 10	< 0.5	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	< 0.5	< 10	< 0.5	< 2.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
DUP1-2009-09-08	P2SB-06	09/08/09	< 0.5	< 10	< 0.5	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	< 0.5	< 10	< 0.5	< 2.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
P2SB-10GW(15)	P2SB-10	12/09/09	< 0.5	**1.9 J**	< 0.5	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	< 0.5	< 10	**0.1 J**	< 2.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
P3SB-02GW(20)	P3SB-02	08/28/09	< 0.5	< 10 J U	< 0.5	< 0.5	**0.3 J**	< 0.5	< 1.0	< 0.5	< 0.5	< 10	< 0.5	< 2.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
P4SB-12GW(13)	P4SB-12	12/16/09	< 0.5	< 10	< 0.5	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	< 0.5	**0.2 J**	< 0.5	< 2.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
P6SB-01GW(17)	P6SB-01	09/09/09	< 0.5	**1.2 J**	< 0.5	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	< 0.5	< 10	< 0.5	< 2.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
DUP1-2009-09-09	P6SB-01	09/09/09	< 0.5	**1.5 J**	< 0.5	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	< 0.5	< 10	< 0.5	< 2.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
P6SB-02GW(15)	P6SB-02	08/27/09	< 0.5	**6.9 J**	< 0.5	< 0.5	**0.2 J**	< 0.5	< 1.0	< 0.5	< 0.5	< 10	< 0.5	< 2.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
P8SB-01GW(28)	P8SB-01	08/31/09	< 0.5	**1.8 J**	< 0.5	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	< 0.5	< 10	< 0.5	< 2.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
P9SB-04GW(15)	P9SB-04	09/09/09	< 1.7	**4.8 J**	< 1.7	< 1.7	< 1.7	**0.6 J**	< 3.3	< 1.7	< 1.7	< 33	< 1.7	< 6.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	ND
P9SB-06GW(17)	P9SB-06	08/27/09	< 1.7	**4.1 J**	< 1.7	< 1.7	**1.6 J**	< 1.7	< 3.3	< 1.7	< 1.7	< 33	< 1.7	< 6.7	< 1.7	< 1.7	**0.6 J**	**0.7 J**	< 1.7	< 1.7	< 1.7	ND
SPSB-04GW(17)	SPSB-04	08/31/09	**0.7 J**	**4.2 J**	**2.6**	**0.3 J**	< 0.8	< 0.8	**0.3 J**	**0.7 J**	**1.3**	< 17	**0.3 J**	**2.4 J**	**1.8**	**0.8 J**	**0.2 J**	< 0.8	< 0.8	< 0.8	**1.1**	ND

Notes:
All results are reported in micrograms per Liter (µg/L).
Samples analyzed using EPA Method 8260.
VOCs - Volatile Organic Compounds, EPA 8260B
NE - not established
< 0.5 or ND - Not detected above the individual laboratory reporting limit for each analyte
NA - Not analyzed
bold - indicates that results exceed laboratory reporting limits
DUP - duplicate sample

ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008, Table B - Groundwater.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.

U - The analyte was analyzed for, but was not detected above, the reported sample quantitation limit.

Table 21
pH, Sulfide, and Cyanide Results in Groundwater
Pier 70 Environmentanl Site Investigation
San Francisco, California

		Chemical Name	**pH**	**Sulfide**	**Total Cyanide**
		ESL	**NE**	**NE**	**0.001**
		Unit	**ph units**	**mg/L**	**mg/L**
Sample Name	**Location ID**	**Sample Date**			
CCSB-03GW(13)	CCSB-03	08/28/09	7.5	< 0.04	< 0.01
P2SB-06GW(17)	P2SB-06	09/08/09	7.0	< 0.04	**0.03**
DUP1-2009-09-08	P2SB-06	09/08/09	7.0	< 0.04	**0.03**
P3SB-02GW(20)	P3SB-02	08/28/09	6.8	< 0.04	< 0.01
P6SB-01GW(17)	P6SB-01	09/09/09	6.6	< 0.04	**0.02**
DUP1-2009-09-09	P6SB-01	09/09/09	6.5	< 0.04	**0.01**
P8SB-01GW(28)	P8SB-01	08/31/09	7.2	< 0.04	**0.04**
P9SB-04GW(15)	P9SB-04	09/09/09	7.1	**3.9**	< 0.01
P9SB-06GW(17)	P9SB-06	08/27/09	7.6	< 0.04	**0.03**
SPSB-04GW(17)	SPSB-04	08/31/09	7.3	< 0.04	< 0.01

Notes:
Sulfide and cyanide results are reported in milligrams per
< 0.04 - not detected above the individual laboratory reporting limit for each analyte
bold - indicates that results exceed laboratory reporting limits
NE - not established

ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008, Table B - Groundwater.

Table 22
PCB Results in Groundwater
Pier 70 Environmental Site Investigation
San Francisco, California

Sample Name	Location ID	Chemical Name	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
		ESL	**0.014**	**0.014**	**0.014**	**0.014**	**0.014**	**0.014**	**0.014**
		Unit	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**
		Sample Date							
CCSB-03	CCSB-03GW(13)	08/28/09	< 0.079*	< 0.29*	< 0.094*	< 0.053*	< 0.054*	< 0.095*	< 0.062*
P2SB-02	P2SB02-GW(15)	08/26/09	< 0.071*	< 0.27*	< 0.085*	< 0.048*	< 0.049*	< 0.086*	< 0.056*
P2SB-04	P2SB04-GW(15)	08/26/09	< 0.071*	< 0.27*	< 0.085*	< 0.048*	< 0.049*	< 0.086*	< 0.056*
P2SB-06	P2SB-06GW(17)	09/08/09	< 0.071*	< 0.26*	< 0.084*	< 0.047*	< 0.049*	< 0.085*	< 0.13*
P2SB-06	DUP1-2009-09-08	09/08/09	< 0.072*	< 0.27*	< 0.086*	< 0.048*	< 0.050*	< 0.087*	< 0.13*
P3SB-02	P3SB-02GW(20)	08/28/09	< 0.071*	< 0.27*	< 0.085*	< 0.048*	< 0.049*	< 0.086*	< 0.056*
P6SB-01	P6SB-01GW(17)	09/09/09	< 0.071*	< 0.26*	< 0.084*	< 0.047*	< 0.049*	< 0.085*	< 0.13*
P6SB-01	DUP1-2009-09-09	09/09/09	< 0.074*	< 0.28*	< 0.088*	< 0.049*	< 0.051*	< 0.089*	< 0.13*
P6SB-02	P6SB-02GW(15)	08/27/09	< 0.072*	< 0.27*	< 0.086*	< 0.048*	< 0.050*	< 0.087*	< 0.056*
P8SB-01	P8SB-01GW(28)	08/31/09	< 0.079*	< 0.29*	< 0.094*	< 0.053*	< 0.054*	< 0.095*	< 0.062*
P9SB-04	P9SB-04GW(15)	09/09/09	< 0.071*	< 0.26*	< 0.084*	< 0.047*	< 0.049*	< 0.085*	< 0.13*
P9SB-06	P9SB-06GW(17)	08/27/09	< 0.060*	< 0.22*	< 0.071*	< 0.040*	< 0.041*	< 0.072*	< 0.047*
SPSB-04	SPSB-04GW(17)	08/31/09	< 0.075*	< 0.28*	< 0.089*	< 0.050*	< 0.052*	< 0.090*	< 0.059*

Notes:

All results are reported in miligrams per Liter (µg/L).

< 0.50 - not detected above the individual laboratory reporting limit for each analyte

PCB - polychlorinated biphynols

* Sample reported to the method detection limit (MDL)

ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008, Table B - Groundwater.

Table 23
Water Quality Parameters
Pier 70 Environmental Investigation
San Francisco, CA

Location ID	Date	pH	DO (mg/L)	ORP/Eh (mV)	Conductivity (mS)	TDS Convert from Conductivity (mg/L)	TDS Measured (mg/L)	Temperature (°C)
Grab Groundwater (depth ft bgs)								
CCSB-03GW(13)	08/28/09	7.54	2.31	80	14.4	9,210	12,710	21.2
CPSB-01GW(15) [1]	09/11/09	NM	NM	NM	NM	NM	NM	NM
P2SB02-GW(15)	08/26/09	7.01	1.12	84	1.595	1,020	NM	20.2
P2SB04-GW(15)	08/26/09	7.10	1.89	28	2.229	1,430	NM	22.5
P2SB-06GW(17)	09/08/09	6.96	3.6	165	3.76	2,410	2,913	17.9
P3SB-02GW(20)	08/28/09	7.31	2.56	126	1.314	841	913	22
P6SB-01GW(17)	09/09/09	6.63	3.2	7	1.629	1,040	1,172	19.1
P6SB-02GW(15)	08/27/09	6.82	2.1	-10	5.408	3,460	NM	31.9
P8SB-01GW(28)	08/31/09	7.19	4.17	168	1.97	1,260	1,424	20.3
P9SB-04GW(15) [1]	09/09/09	NM	NM	NM	NM	NM	NM	NM
P9SB-06GW(17) [1]	08/27/09	NM	NM	NM	NM	NM	NM	NM
SPSB-04GW(17)	08/31/09	7	0.06	-5	40.1	25,700	42,000	21.3
Monitoring Well								
CCMW-01	10/05/09	7.8	0.23	-14.2	3.588	2,300	NM	23.46
	03/19/10	8.18	2.6	-152.3	2.888	1,850	NM	16.72
	04/26/10	NM	NM	NM	3	1,920	2,459	NM
SPMW-01	10/05/09	7.06	0.12	-143.4	42.68	27,300	NM	19.28
	03/18/10	7.5	3.17	-208.1	29.863	19,100	NM	15.64
	04/26/10	NM	NM	NM	35.87	22,900	41,060	NM
CPMW-01	10/06/09	6.85	0.42	-137.9	0.539	345	NM	21.86
	03/18/10	6.93	1.72	-216.6	0.410	262	NM	19.35
P2MW-01	10/05/09	6.72	0.34	-103.5	3.678	2,350	NM	22.17
	03/17/10	6.86	3.49	-207.9	3.659	2,340	NM	18.72
P3MW-01	10/05/09	7.04	0.16	-34.6	1.013	648	NM	19.51
	03/18/10	7.29	16.33	-106.9	0.584	374	NM	16.65
	04/26/10	NM	NM	NM	1.403	898	1,073	NM
P8MW-01	10/06/09	7.46	2.35	247.8	1.752	1,120	NM	21.99
	03/18/10	7.36	9.06	-138.8	1.204	770	NM	17.81
	04/26/10	NM	NM	NM	NM	NM	4,431	NM
P9MW-01	10/06/09	7.23	1.25	-138.0	24.61	15,700	NM	20.3
	03/17/10	7.69	4.26	-303.2	16.827	10,800	NM	16.67
	04/26/10	NM	NM	NM	19.3	12,300	19,810	NM
P9MW-02	10/06/09	6.69	1.65	-88.0	14.45	9,250	NM	19.1
	03/17/10	6.8	8.98	-113.0	11.61	7,430	NM	16.30
P9MW-03	03/17/10	7.05	9.98	-189.2	21.298	13,600	NM	16.96
P9MW-04	03/17/10	8.16	13.24	-379.7	25.575	16,400	NM	15.61
	04/26/10	NM	NM	NM	34.93	22,300	39,910	NM
SBGWDG3	03/19/10	8.5	8.19	-257.2	2.523	1,610	NM	17.10
SBGWDG4	03/19/10	7.5	5.39	-162.6	1.138	728	NM	16.26
TMW-28A	03/18/10	8.33	2.43	-374.9	36.956	23,600	NM	17

Notes:

GW - Grab groundwater sample
MW - Monitoring Well
DO - dissolved oxygen
TDS - Total Dissolved Solids
ORP/Eh - Oxidation Reduction Potential
mg/L - milligrams per liter

mS - millisiemens
ppt - parts per trillion
°C - degrees celcius
feet bgs - feet below ground surface
NM - Not measured

[1] - groundwater parameters not measured due to presence of degraded petroleum hydrocarbons

Table 24
TPH Results in Groundwater Monitoring Wells
Pier 70 Environmental Site Investigation
San Francisco, California

		Chemical Name	**TPHg**	**TPHd**	**TPHmo**
		ESL[1]	**210**	**210**	**210**
		Eco SL[2]	**210**	**210**	**210**
		Unit	**µg/L**	**µg/L**	**µg/L**
Sample Name	**Location ID**	**Sample Date**			
CCMW-01-2009-10-5	CCMW-01	10/05/09	**37 J**	**93 Y**	< 82*
CCMW-01-2010-3-19	CCMW-01	03/19/10	**44**	**140**	< 63*
DUP-1-2010-3-19	CCMW-01	03/19/10	**48**	**97**	< 63*
CPMW-01-2009-10-6	CPMW-01	10/06/09	**23 J**	**150 Y**	**160 J**
CPMW-01-2010-3-18	CPMW-01	03/18/10	**40**	**82**	< 63*
SBGWDG3-2010-3-19	GWDG3	03/19/10	**42**	**30**	< 82*
SBGWDG4-2010-3-19	GWDG4	03/19/10	**26**	**8.6**	< 82*
P2MW-01-2009-10-5	P2MW-01	10/05/09	**21 J**	< 50	< 82*
P2MW-01-2010-3-17	P2MW-01	03/17/10	**28**	< 50	< 63*
P3MW-01-2009-10-5	P3MW-01	10/05/09	**34 J**	**7.8 J**	< 82*
P3MW-01-2010-3-18	P3MW-01	03/18/10	**15**	**17**	< 63*
P8MW-01-2009-10-6	P8MW-01	10/06/09	**16 J**	**14 JY**	< 82*
P8MW-01-2010-3-18	P8MW-01	03/18/10	**29**	**16**	< 63*
P9MW-01-2009-10-6	P9MW-01	10/06/09	**23 J**	**64 Y**	< 81*
P9MW-01-2010-3-17	P9MW-01	03/17/10	**17**	**18**	< 81*
P9MW-02-2009-10-6	P9MW-02	10/06/09	**25 J**	**47 JY**	< 81*
P9MW-02-2010-3-17	P9MW-02	03/17/10	**25**	**120**	**130**
DUP-1-2010-3-17	P9MW-02	03/17/10	**23**	**63**	< 81*
P9MW-03-2010-3-17	P9MW-03	03/17/10	**22**	**44**	< 81*
P9MW-04-2010-3-17	P9MW-04	03/17/10	**15**	**17**	< 81*
SPMW-01-2009-10-5	SPMW-01	10/05/09	< 50	**10 J**	< 63*
DUP1-2009-10-5	SPMW-01	10/05/09	< 50 J U	**9.8 J**	< 63*
SPMW-01-2010-3-18	SPMW-01	03/18/10	**21**	**9.8**	< 63*
TMW-28A-2010-3-18	TMW-28A	03/18/10	**35**	**41**	< 63*

Notes:

All results are reported in micrograms per Liter (µg/L).

TPHg - Total Petroleum Hydrocarbons as Gasoline Range (C7-C12), EPA Method 8015M

TPHd - Total Petroleum Hydrocarbons as Diesel Range (C10-C24), EPA Method 8015M

TPHmo - Total Petroleum Hydrocarbons as Motor Oil (C24-C36), EPA Method 8015M

bold - indicates that results exceed laboratory reporting limits

MW - Monitoring Well

DUP - duplicate sample

< 50 - not detected above the individual laboratory reporting limit for each analyte

* Sample reported to the method detection limit (MDL)

[1] ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008, Table B - Groundwater.

[2] Eco SL - Ecological Screening Level taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008, Table F - Marine Habitats.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.

Y - Sample exhibits a fuel pattern, which does not resemble standard.

Table 25
PAH Results in Groundwater Monitoring Wells
Pier 70 Environmental Site Investigation
San Francisco, California

		Chemical Name	**Acenaph- thene**	**Acenaph- thylene**	**Anthracene**	**Benzo (a) anthracene**	**Benzo (a) pyrene**	**Benzo (b) fluoranthene**	**Benzo (g,h,i) perylene**	**Benzo (k) fluoran- thene**	**Chrysene**	**Dibenzo (a,h) anthracene**	**Fluoran thene**	**Fluorene**	**Indeno (1,2,3-cd) pyrene**	**Naphthalene**	**Phenanthrene**	**Pyrene**
		ESL[1]	**23**	**30**	**0.73**	**0.027**	**0.014**	**0.029**	**0.1**	**0.4**	**0.35**	**0.25**	**8**	**3.9**	**0.048**	**24**	**4.6**	**2**
		Eco SL[2]	**20**	**30**	**0.73**	**0.027**	**0.014**	**0.029**	**0.1**	**0.049**	**0.049**	**0.049**	**8**	**3.9**	**0.048**	**21**	**4.6**	**2**
		Unit	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**
Sample Name	**Location ID**	**Sample Date**																
CCMW-01-2009-10-5	CCMW-01	10/05/09	**0.4**	**0.2**	**0.2**	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	**0.1**	**0.7**	< 0.02*	**0.1 b**	**0.6**	**0.1**
CCMW-01-2010-3-19	CCMW-01	03/19/10	**0.3**	**0.08**	**0.2**	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.02*	< 0.02*	< 0.02*	**0.09**	**0.4**	< 0.02*	**0.05**	**0.5**	**0.1**
DUP-1-2010-3-19	CCMW-01	03/19/10	**0.4**	**0.08**	**0.2**	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	**0.1**	**0.4**	< 0.02*	**0.05**	**0.5**	**0.1**
CPMW-01-2009-10-6	CPMW-01	10/06/09	**0.1**	< 0.1	< 0.1	**0.05 J**	**0.04 J**	**0.06 J**	**0.02 J**	< 0.02*	**0.07 J**	< 0.02*	**0.1**	< 0.1	< 0.02*	**0.03 J**	< 0.1	**0.2**
CPMW-01-2010-3-18	CPMW-01	03/18/10	**0.08**	< 0.09	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.09	< 0.02*	**0.02**	< 0.09	**0.05**
SBGWDG3-2010-3-19	GWDG3	03/19/10	**0.2**	**0.07**	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.02*	< 0.03*	< 0.02*	**0.2**	< 0.09	< 0.02*	**0.03**	**0.02**	**0.2**
SBGWDG4-2010-3-19	GWDG4	03/19/10	< 0.09	< 0.09	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.02*	< 0.03*	< 0.02*	< 0.09	< 0.09	< 0.02*	< 0.09	< 0.09	< 0.09
P2MW-01-2009-10-5	P2MW-01	10/05/09	**0.2**	< 0.1	**0.04 J**	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	**0.04 J**	**0.03 J**	< 0.02*	**0.06 J**	**0.08 J**	**0.06 J**
P2MW-01-2010-3-17	P2MW-01	03/17/10	**0.07**	< 0.09	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	**0.02**	< 0.02*	**0.04**	**0.07**	**0.03**
P3MW-01-2009-10-5	P3MW-01	10/05/09	< 0.1	< 0.1	< 0.1	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.1	< 0.1	< 0.02*	< 0.1	**0.02 J**	**0.02 J**
P3MW-01-2010-3-18	P3MW-01	03/18/10	< 0.09	< 0.09	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.09	< 0.02*	< 0.09	< 0.09	< 0.09
P8MW-01-2009-10-6	P8MW-01	10/06/09	< 0.1	**0.08 J**	**0.2**	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.1	< 0.1	< 0.02*	< 0.1	< 0.1	< 0.1
P8MW-01-2010-3-18	P8MW-01	03/18/10	< 0.09	**0.09**	**0.2**	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.09	< 0.02*	< 0.09	< 0.09	< 0.09
P9MW-01-2009-10-6	P9MW-01	10/06/09	< 0.09	< 0.09	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	**0.09 J**	< 0.02*	**0.03 J**	**0.1**	**0.02 J**
P9MW-01-2010-3-17	P9MW-01	03/17/10	< 0.09	< 0.09	**0.02**	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.09	< 0.02*	**0.02**	< 0.09	< 0.09
P9MW-02-2009-10-6	P9MW-02	10/06/09	**0.1**	< 0.1	< 0.1	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.1	< 0.1	< 0.02*	< 0.1	< 0.1	**0.03 J**
P9MW-02-2010-3-17	P9MW-02	03/17/10	**0.04**	< 0.09	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.09	< 0.02*	< 0.09	< 0.09	**0.02**
DUP-1-2010-3-17	P9MW-02	03/17/10	**0.05**	< 0.09	**0.02**	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.09	< 0.02*	< 0.09	**0.02**	**0.03**
P9MW-03-2010-3-17	P9MW-03	03/17/10	**0.8**	**0.08**	**0.2**	**0.02**	< 0.02*	< 0.02*	< 0.09	< 0.02*	< 0.02*	< 0.02*	**0.3**	**0.6**	< 0.02*	**1.3**	**1.3**	**0.2**
P9MW-04-2010-3-17	P9MW-04	03/17/10	< 0.09	< 0.09	**0.02**	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.09	< 0.02*	< 0.09	**0.02**	< 0.09
SPMW-01-2009-10-5	SPMW-01	10/05/09	< 0.09	< 0.09	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.02*	< 0.02*	< 0.02*	< 0.09	< 0.09	< 0.02*	< 0.09	< 0.09	< 0.09
DUP1-2009-10-5	SPMW-01	10/05/09	< 0.1	< 0.1	< 0.1	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.1	< 0.1	< 0.02*	< 0.1	< 0.1	< 0.1
SPMW-01-2010-3-18	SPMW-01	03/18/10	< 0.1	< 0.1	< 0.1	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.02*	< 0.1	< 0.1	< 0.02*	< 0.1	< 0.1	< 0.1
TMW-28A-2010-3-18	TMW-28A	03/18/10	**0.05**	**0.3**	**0.09**	< 0.02*	**0.1**	**0.1**	**0.04**	**0.03**	**0.06**	< 0.02*	**0.1**	< 0.09	**0.03**	**0.2**	**0.02**	**6.4**

Notes:
All results are reported in micrograms per Liter (µg/L).
Samples analyzed by EPA Method 8270.
bold - indicates that results exceed laboratory reporting limits
gray shading indicates result exceeds ESL for non-drinking water.
MW - Monitoring Well
DUP - duplicate sample
PAH - Polycyclic aromatic hydrocarbons
< 0.1 - not detected above the individual laboratory reporting limit for each analyte
* Sample reported to the method detection limit (MDL)

[1] ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008, Table B - Groundwater.

[2] Eco SL - Ecological Screening Level taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008, Table F - Marine Habitats.
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.

Table 26
Metals Results in Groundwater Monitoring Wells
Pier 70 Environmental Site Investigation
San Francisco, California

		Chemical Name	Antimony	Arsenic		Barium	Beryllium	Cadmium		Chromium		Chromium VI	Cobalt		Copper		Lead		Mercury		Molybdenum	Nickel		Selenium	Silver	Vanadium	Zinc	
		Dissolved or Total	D	D	T	D	D	D	T	D	T	D	D	T	D	T	D	T	D	T	D	D	T	D	D	D	D	T
		ESL[1]	30	36	36	1,000	0.53	0.25	0.25	180	180	11	3	3	3.1	3.1	2.5	2.5	0.025	0.025	240	8.2	8.2	5	0.19	19	81	81
		Eco SL[2]	30	0.14	NE	1,000	0.53	0.25	NE	180	NE	NE	3	NE	3.1	NE	2.5	NE	0.025	NE	240	8.2	NE	5	0.19	19	81	NE
		Unit	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Location ID	Sample Name	Sample Date																										
CCMW-01	CCMW-01-2009-10-5	10/05/09	**0.54 J**	**3.9**	NA	**150**	< 0.12*	< 0.083*	NA	**0.53 J**	NA	NA	**0.83 J**	NA	< 1.0	NA	**12**	NA	< 0.038*	NA	**4.7**	**5.7**	NA	< 1.0	< 0.068*	**2.5**	**9.2**	NA
CCMW-01	CCMW-01-2010-3-19	03/19/10	NA	**3.2**	**5.3**	NA	NA	< 1.3*	< 1.4*	< 5.0	< 5.0	< 10	< 1.1*	**1.0**	< 1.4*	< 1.3*	< 1.0*	**15**	< 0.015*	< 0.015*	NA	< 5.0	**2.7**	NA	NA	NA	< 20	**20**
CCMW-01	DUP-1-2010-3-19	03/19/10	NA	**4.4**	**7.5**	NA	NA	< 1.3*	< 1.4*	< 5.0	< 5.0	< 10	< 1.1*	< 1.0*	< 1.4*	< 1.3*	< 1.0*	**14**	< 0.015*	< 0.015*	NA	< 5.0	**2.6**	NA	NA	NA	< 20	< 20
CPMW-01	CPMW-01-2009-10-6	10/06/09	**1.7**	**120**	NA	**63**	< 0.092*	< 0.16	NA	**0.47 J**	NA	NA	**0.41 J**	NA	**1.7**	NA	**0.17 J**	NA	< 0.038*	NA	**1.9**	**1.2**	NA	**0.19 J**	< 0.090*	**1.7**	**4.0 J**	NA
CPMW-01	CPMW-01-2010-3-18	03/18/10	NA	**72**	**130**	NA	NA	< 1.3*	< 1.3*	< 5.0	< 5.0	NA	< 1.1*	< 1.1*	< 5.0	< 1.4*	< 1.0*	< 1.0*	< 0.015*	< 0.015*	NA	< 5.0	< 5.0	NA	NA	NA	**9.0**	< 20
GWDG3	SBGWDG3-2010-3-19	03/19/10	NA	**2.0**	**2.4**	NA	NA	< 1.3*	< 1.4*	< 5.0	< 5.0	NA	< 1.1*	< 1.0*	< 1.4*	< 1.3*	< 1.0*	**22**	< 0.015*	< 0.015*	NA	< 5.0	**2.3**	NA	NA	NA	< 20	< 20
GWDG4	SBGWDG4-2010-3-19	03/19/10	NA	**1.9**	**3.3**	NA	NA	< 1.3*	< 1.4*	< 5.0	**2.7**	NA	< 1.1*	< 1.0*	< 1.4*	< 1.3*	< 1.0*	**1.1**	< 0.015*	< 0.015*	NA	**2.6**	**8.5**	NA	NA	NA	< 20	< 20
P2MW-01	P2MW-01-2009-10-5	10/05/09	**0.85 J**	**1.2**	NA	**380**	< 0.12*	< 0.083*	NA	**0.18 J**	NA	NA	**1.2**	NA	< 1.0	NA	**0.24 J**	NA	< 0.038*	NA	**1.9**	**2.8**	NA	**0.33 J**	< 0.068*	**0.53 J**	**7.3**	NA
P2MW-01	P2MW-01-2010-3-17	03/17/10	NA	**4.7**	**4.1**	NA	NA	< 1.3*	< 1.3*	< 5.0	< 5.0	NA	< 1.1*	< 1.1*	**2.0**	**10**	< 1.0*	**29**	< 0.015*	**0.37**	NA	< 5.0	< 5.0	NA	NA	NA	< 20	**100**
P3MW-01	P3MW-01-2009-10-5	10/05/09	**0.49 J**	**4.2**	NA	**30**	< 1.0	< 1.0	NA	**0.33 J**	NA	NA	**2.1**	NA	**0.30 J**	NA	**0.42 J**	NA	< 0.038*	NA	**3.1**	**10**	NA	**0.58 J**	< 0.068*	**4.3**	**10**	NA
P3MW-01	P3MW-01-2010-3-18	03/18/10	NA	**2.9**	**5.2**	NA	NA	< 1.3*	< 1.3*	**20**	**27**	NA	< 1.1*	< 1.1*	< 1.4*	**2.5**	< 1.0*	< 1.0*	< 0.015*	< 0.015*	NA	**3.1**	**6.4**	NA	NA	NA	< 20	< 20
P8MW-01	P8MW-01-2009-10-6	10/06/09	**1.4**	**2.3**	NA	**38**	< 0.092*	< 0.16*	NA	**3.8**	NA	NA	**0.43 J**	NA	**33**	NA	**2.0**	NA	< 0.038*	NA	**3.8**	**2.9**	NA	**0.48 J**	< 0.090*	**6.6**	**22**	NA
P8MW-01	P8MW-01-2010-3-18	03/18/10	NA	**4.8**	**4.0**	NA	NA	< 1.3*	< 1.3*	< 5.0	< 5.0	< 10	< 1.1*	< 1.1*	< 1.4*	**2.3**	< 1.0*	< 1.0*	< 0.015*	< 0.015*	NA	< 5.0	**1.7**	NA	NA	NA	< 20	< 20
P9MW-01	P9MW-01-2009-10-6	10/06/09	**0.22 J**	**0.75 J**	NA	**510**	< 0.092*	< 0.16*	NA	**0.18 J**	NA	NA	**0.59 J**	NA	**5**	NA	**0.26 J**	NA	< 0.038*	NA	**0.48 J**	**0.74 J**	NA	< 1.0	< 0.090*	**1.8**	**6.9**	NA
P9MW-01	P9MW-01-2010-3-17	03/17/10	NA	**7.2**	**4.1**	NA	NA	< 1.3*	< 1.4*	< 5.0	**2.5**	NA	**1.2**	**1.7**	**2.0**	**4**	< 1.0*	< 1.0*	< 0.015*	**0.066**	NA	< 5.0	**2.5**	NA	NA	NA	**13**	< 20
P9MW-02	P9MW-02-2009-10-6	10/06/09	< 1.0	**0.38 J**	NA	**580**	< 1.0	< 1.0	NA	**1.9**	NA	NA	**0.39 J**	NA	**2.5**	NA	< 0.15*	NA	< 0.038*	NA	**0.87 J**	**3.3**	NA	< 1.0	< 0.090*	**0.18 J**	**2.1 J**	NA
P9MW-02	P9MW-02-2010-3-17	03/17/10	NA	**6.6**	< 5.0	NA	NA	< 1.3*	< 1.4*	< 5.0	< 5.0	< 10	< 1.1*	**1.1**	< 1.4*	**2.9**	< 1.0*	< 1.0*	< 0.015*	< 0.033*	NA	< 5.0	**2.0**	NA	NA	NA	< 20	< 20
P9MW-02	DUP-1-2010-3-17	03/17/10	NA	**5.0**	**3.7**	NA	NA	< 1.3*	< 1.4*	**2.2**	**1.8**	NA	<1.1*	**1.2**	< 1.4*	**1.4**	< 1.0*	< 1.0*	< 0.015*	< 0.033*	NA	**1.3**	**3.1**	NA	NA	NA	**51**	< 20
P9MW-03	P9MW-03-2010-3-17	03/17/10	NA	**10**	**3.9**	NA	NA	< 1.3*	< 1.4*	**1.4**	**5.8**	NA	**11**	**13**	< 1.4*	< 1.3*	< 1.0*	< 1.0*	< 0.015*	**0.042**	NA	**12**	**18**	NA	NA	NA	< 20	< 20
P9MW-04	P9MW-04-2010-3-17	03/17/10	NA	**12**	**7.7**	NA	NA	< 1.3*	< 1.4*	< 5.0	**4.1**	NA	< 1.1*	**1.8**	< 1.4*	**2.3**	< 1.0*	< 1.0*	< 0.015*	< 0.033*	NA	< 5.0	**2.3**	NA	NA	NA	**63**	< 20
SPMW-01	SPMW-01-2009-10-5	10/05/09	**0.21 J**	**0.95 J**	NA	**130**	< 0.12*	< 0.083*	NA	< 1.0 J U	NA	NA	**7.2**	NA	< 1.0	NA	< 1.0 J U	NA	< 0.038*	NA	**4.0**	**5.5**	NA	< 1.0	< 0.068*	< 1.0 J U	**17**	NA
SPMW-01	DUP1-2009-10-5	10/05/09	**0.23 J**	**0.89 J**	NA	**130**	< 0.12*	< 0.083*	NA	< 1.0	NA	NA	**7**	NA	**3.1**	NA	< 1.0	NA	< 0.038*	NA	**3.9**	**5.0**	NA	< 1.0	< 0.068*	< 1.0 J U	**6.4**	NA
SPMW-01	SPMW-01-2010-3-18	03/18/10	NA	**18**	**20**	NA	NA	< 1.3*	< 1.3*	< 5.0	< 5.0	NA	**2.1**	**2.8**	< 1.4*	**2.7**	< 1.0*	< 1.0*	< 0.015*	< 0.015*	NA	**2.6**	**4.0**	NA	NA	NA	**8.4**	< 20
TMW-28A	TMW-28A-2010-3-18	03/18/10	NA	**20**	**18**	NA	NA	< 1.3*	< 1.3*	< 5.0	< 5.0	NA	< 1.1*	< 1.1*	< 5.0	**2.4**	< 1.0*	< 1.0*	< 0.015*	< 0.015*	NA	< 5.0	< 5.0	NA	NA	NA	**13**	< 20

Notes:
All results are reported in micrograms per Liter (µg/L).
Samples analyzed by EPA Method 6010.
bold - indicates that results exceed laboratory reporting limits
gray shading indicates result exceeds ESL for non-drinking water.
MW - Monitoring Well
DUP - duplicate sample
NA - not analyzed
NE - not established
< 1.0 - not detected above the individual laboratory reporting limit for each analyte
D - dissolved
T - total
* Sample reported to the method detection limit (MDL)

[1] ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008, Table B - Groundwater.

[2] Eco SL - Ecological Screening Level taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008, Table F - Marine Habitats.
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.

Table 27
VOC Results in Groundwater Monitoring Wells
Pier 70 Environmental Site Investigation
San Francisco, California

Location ID	Sample Name	Chemical Name	1,1-Dichloro-ethane	1,1-Dichloro-ethene	1,2,4-Trimethyl-benzene	Acetone	Carbon Disulfide	Chloroform	Methyl ethyl ketone	Methylene Chloride	Naphthalene	para-Isopropyl-toluene	tert-Butyl-benzene	All Other VOCs
		ESL[1]	**47**	**25**	**NE**	**1,500**	**NE**	**330**	**14,000**	**2,200**	**24**	**NE**	**NE**	**NE**
		Eco SL[2]	**47**	**NE**	**NE**	**1,500**	**NE**	**470**	**8,400**	**1,600**	**21**	**NE**	**NE**	**Table M-9**
		Unit	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**
Location ID	**Sample Name**	**Sample Date**												
CCMW-01	CCMW-01-2009-10-5	10/05/09	< 0.5	< 0.5	< 0.5	< 10	< 0.5	< 0.5	< 10	**0.6 J**	< 2.0	< 0.5	**0.2 J**	ND
CPMW-01	CPMW-01-2009-10-6	10/06/09	< 0.5	< 0.5	< 0.5	< 10	< 0.5	< 0.5	< 10	< 10	< 2.0	< 0.5	< 0.5	ND
P2MW-01	P2MW-01-2009-10-5	10/05/09	< 0.5	< 0.5	< 0.5	**1.5 J**	< 0.5	< 0.5	< 10	< 10	< 2.0	< 0.5	< 0.5	ND
P3MW-01	P3MW-01-2009-10-5	10/05/09	< 0.5	< 0.5	< 0.5	< 10	< 0.5	< 0.5	< 10	**0.2 J**	< 2.0	< 0.5	< 0.5	ND
P8MW-01	P8MW-01-2009-10-6	10/06/09	< 0.5	< 0.5	< 0.5	< 10	**0.1 J**	**0.1 J**	< 10	< 10	< 2.0	< 0.5	< 0.5	ND
P9MW-01	P9MW-01-2009-10-6	10/06/09	< 0.5	< 0.5	< 0.5	< 10	< 0.5	< 0.5	< 10	< 10	< 2.0	< 0.5	< 0.5	ND
P9MW-01	P9MW-01-2010-3-17	03/17/10	< 0.5	< 0.5	< 0.5	< 10	**0.1**	< 0.5	< 10	< 10	< 2.0	< 0.5	< 0.5	ND
P9MW-02	P9MW-02-2009-10-6	10/06/09	**0.3 J**	< 0.5	< 0.5	< 10	< 0.5	< 0.5	< 10	< 10	< 2.0	< 0.5	< 0.5	ND
P9MW-02	P9MW-02-2010-3-17	03/17/10	**0.2**	< 0.5	< 0.5	**1.2**	< 0.5	< 0.5	< 10	< 10	< 2.0	< 0.5	< 0.5	ND
P9MW-03	P9MW-03-2010-3-17	03/17/10	**31**	**1.0**	**0.4**	**3.4**	< 0.5	< 0.5	**1.1**	< 10	**2.0**	**0.3**	< 0.5	ND
P9MW-04	P9MW-04-2010-3-17	03/17/10	< 0.5	< 0.5	< 0.5	< 10	**0.2**	< 0.5	< 10	< 10	< 2.0	< 0.5	< 0.5	ND
SPMW-01	SPMW-01-2009-10-5	10/05/09	< 0.5	< 0.5	< 0.5	< 10	< 0.5	< 0.5	< 10	< 10	< 2.0	**0.9**	< 0.5	ND
SPMW-01	DUP1-2009-10-5	10/05/09	< 0.5	< 0.5	< 0.5	< 10	< 0.5	< 0.5	< 10	< 10	< 2.0	**1.3**	< 0.5	ND
SPMW-01	SPMW-01-2010-3-18	03/18/10	< 0.5	< 0.5	< 0.5	< 10	< 0.5	< 0.5	< 10	< 10	< 2.0	< 0.5	< 0.5	ND
TMW-28A	TMW-28A-2010-3-18	03/18/10	< 0.5	< 0.5	< 0.5	< 10	< 0.5	< 0.5	< 10	< 10	**0.3**	< 0.5	< 0.5	ND
TMW-28A	DUP-1-2010-3-18	03/18/10	< 0.5	< 0.5	< 0.5	< 10	< 0.5	< 0.5	< 10	**0.2**	< 2.0	< 0.5	< 0.5	ND

Notes:

All results are reported in micrograms per Liter (µg/L).
Samples analyzed by EPA Method 8260B.
VOCs - Volatile Organic Compounds
MW - Monitoring Well
NE - Not established
< 0.5 or ND - Not detected above the individual laboratory reporting limit for each analyte
bold - indicates that results exceed laboratory reporting limits laboratory reporting limits
DUP - duplicate sample

[1] ESL - Environmental Screening Levels taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008, Table B - Groundwater.

[2] Eco SL - Ecological Screening Level taken from San Francisco Bay Regional Water Quality Control Board, California Environmental Protection Agency Screening for Environmental Concerns at Sites with Contamination in Soil and Groundwater, May 2008, Table F - Marine Habitats.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.

Table 28
Soil Gas Analytical Results
Pier 70 Environmental Site Investigation
San Francisco, California

				Chemical Name	1,1,1-TCA	1,1-DFA	1,2,4-TMB	1,3,5-TMB	4-Ethyl-toluene	Acetone	Benzene	Carbon Disulfide	Chloroform	Dichloro-difluoro-methane	Ethanol	Ethyl Benzene	Methane		Methyl butyl ketone	Methyl ethyl ketone	Naph-thalene	PCE	Toluene	TPHg	TCE	Trichloro-fluoro-methane	Vinyl Acetate	Xylene, o-	Xylenes, m,p-	All other VOCs
				ESL Residential	**460**	**NE**	**NE**	**NE**	**NE**	**660**	**0.084**	**NE**	**0.46**	**NE**	**NE**	**0.98**	**NE**	**1.25****	**NE**	**1,000**	**0.072**	**0.41**	**63**	**10**	**1.2**	**NE**	**NE**	**NE**	**NE**	**NE**
				ESL Commercial	**1,300**	**NE**	**NE**	**NE**	**NE**	**1,800**	**0.28**	**NE**	**1.5**	**NE**	**NE**	**3.3**	**NE**	**5.0*****	**NE**	**2,900**	**0.24**	**1.4**	**180**	**29**	**4.1**	**NE**	**NE**	**NE**	**NE**	**NE**
				Unit	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	%	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Location ID	Purge Volume	Start Depth	End Depth	Sample Date																										
P1SG-01		4.5	5	10/29/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	**0.18**	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
		4.5	5	10/30/09	< 0.0041	NA	< 0.011	< 0.0037	< 0.0037	**0.012**	**0.0058**	< 0.0095	**0.017**	**0.004**	NA	**0.0042**	**16**	**0.002**	< 0.0093	**0.0082**	< 0.08	**0.21**	**0.013**	NA	**0.026**	< 0.0085	< 0.011	**0.0047**	**0.016**	ND
P1SG-02		4.5	5	10/29/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P1SG-03		2	2	01/11/10	< 0.0045	< 0.0090	**0.15**	**0.047**	**0.068**	**0.038**	**0.030**	< 0.010	< 0.0041	< 0.0041	**0.023**	**0.15**	**3.1**	**0.00047**	< 0.010	**0.019**	< 0.087	< 0.0056	**0.44**	NA	< 0.0045	< 0.0093	< 0.012	**0.18**	**0.50**	ND
P1SG-04		3	3	01/11/10	< 0.0043	< 0.0084	**0.096**	**0.027**	**0.028**	**0.0081**	**0.015**	< 0.0097	**0.0078**	< 0.0039	**0.020**	**0.051**	< 1.0	--	< 0.0096	< 0.0069	< 0.082	**0.11**	**0.18**	NA	**0.024**	< 0.0088	< 0.011	**0.066**	**0.16**	ND
P2SG-01		4.5	5	10/29/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P2SG-02		4.5	5	10/29/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P2SG-02 Dup*		4.5	5	10/29/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P2SG-03		3.5	4	10/29/09	< 0.1	NA	NA	NA	NA	NA	**0.67**	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	**0.31**	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
		3.5	4	10/30/09	< 1.2	NA	< 3.3	< 1.1	< 1.1	< 2.1	**0.83**	**4.1**	< 1.1	< 1.1	NA	< 0.98	**31**	**0.0047**	< 2.8	< 2	< 24	< 1.5	**1.2**	**4,400**	< 1.2	< 2.5	< 3.2	< 0.98	< 3.9	ND
P2SG-04		3.5	4	10/29/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P2SG-05		4	4	01/11/10	**0.027**	< 0.032	**0.066**	**0.018**	**0.022**	< 0.029	**0.034**	< 0.037	< 0.015	< 0.015	< 0.057	**0.057**	**780**	**0.12**	< 0.037	< 0.027	< 0.31	< 0.020	**0.21**	NA	< 0.016	< 0.034	< 0.042	**0.065**	**0.17**	ND
DUP-2010-01-11		4	4	01/11/10	**0.032**	< 0.031	**0.050**	**0.014**	**0.015**	< 0.027	**0.027**	< 0.036	< 0.014	< 0.014	< 0.054	**0.041**	**780**	**0.12**	< 0.035	< 0.025	< 0.30	< 0.020	**0.14**	NA	< 0.015	< 0.032	< 0.041	**0.045**	**0.11**	ND
P2SG-06		4	4	01/11/10	< 0.0079	< 0.016	**0.046**	**0.013**	**0.0093**	**0.022**	**0.030**	**0.021**	< 0.0071	< 0.0072	< 0.027	**0.015**	**1.6**	**0.00024**	< 0.018	< 0.013	< 0.15	< 0.0098	**0.041**	NA	< 0.0078	< 0.016	< 0.020	**0.022**	**0.046**	ND
P3SG-01		9.5	10	10/28/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P4SG-02		4.5	5	10/28/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P4SG-04		3.5	4	10/28/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P4SG-05		7.5	8	10/28/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P4SG-07		3.5	4	10/28/09	**0.16**	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P4SG-08		4	4.5	10/28/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P4SG-09		4	4	01/11/10	< 0.0042	< 0.0083	**0.20**	**0.066**	**0.087**	< 0.0073	**0.093**	< 0.0096	< 0.0038	< 0.0038	**0.036**	**0.24**	**4.8**	**0.00073**	< 0.0095	< 0.0068	< 0.081	< 0.0052	**1.0**	NA	< 0.0041	< 0.0087	< 0.011	**0.26**	**0.65**	ND
P5SG-01		3.5	4	10/30/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P5SG-02		4.5	5	10/30/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P5SG-02 Dup*		4.5	5	10/30/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P5SG-03		4.5	5	10/30/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	**0.2**	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P5SG-04		6.5	7	10/28/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P6SG-02		6.5	7	10/28/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P6SG-03	1	3.5	4	10/28/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
	3	3.5	4	10/28/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
	7	3.5	4	10/28/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P6SG-04		5	5	01/11/10	< 0.0044	< 0.0086	**0.12**	**0.042**	**0.027**	**0.0093**	**0.0031**	< 0.010	< 0.0039	< 0.0040	< 0.015	**0.010**	< 1.0	--	< 0.0098	< 0.0071	< 0.084	< 0.0054	**0.026**	NA	< 0.0043	< 0.0090	< 0.011	**0.023**	**0.053**	ND
P6SGP-01		4.5	5	11/24/09	< 0.0042	NA	< 0.011	< 0.0038	< 0.0038	< 0.0073	**0.024**	**0.01**	< 0.0037	< 0.0038	NA	**0.0051**	**1,200**	**0.18**	< 0.0094	**0.0092**	< 0.04	< 0.0052	**0.015**	NA	< 0.0041	< 0.0086	< 0.011	**0.0056**	**0.016**	ND
		4.5	5	4/9/2010	< 0.0049	**0.016**	< 0.013	< 0.0044	< 0.0044	< 0.0086	**0.014**	< 0.011	< 0.0044	**0.0053**	< 0.017	< 0.0039	**870**	**0.13**	< 0.011	< 0.0080	< 0.094	< 0.0061	< 0.0034	NA	< 0.0048	< 0.010	< 0.013	< 0.0039	< 0.016	ND
		4.5	5	10/28/10	< 0.0039	< 0.0077	**0.041**	**0.011**	**0.0036**	**0.016**	**0.010**	< 0.0089	< 0.0035	**0.0081**	< 0.013	< 0.0031	**710**		< 0.0088	< 0.0063	**0.26**	< 0.0048	< 0.0027	NA	< 0.0038	< 0.0080	< 0.010	< 0.0031	< 0.012	ND
		4.5	5	07/17/10	< 0.0044	< 0.0088	< 0.012	< 0.0040	< 0.0040	**0.021**	**0.018**	**0.016**	< 0.0040	**0.0066**	< 0.015	< 0.0035	**970**	**0.15**	NA	NA	< 0.085	< 0.0055	< 0.0031	NA	**0.0067**	< 0.0091	< 0.011	< 0.0035	< 0.014	ND
P6SGP-02		4.5	5	11/24/09	**0.0077**	NA	< 0.011	< 0.0037	< 0.0037	**0.02**	< 0.0024	< 0.0094	< 0.0037	< 0.0037	NA	< 0.0033	**1.2**	**0.00018**	< 0.0093	< 0.0067	< 0.041	**0.01**	**0.0044**	NA	< 0.0041	< 0.0085	< 0.011	< 0.0033	< 0.013	ND
		4.5	5	4/9/2010	**0.0050**	< 0.0082	< 0.011	< 0.0037	< 0.0037	**0.0093**	< 0.0024	< 0.0095	< 0.0037	< 0.0038	< 0.014	< 0.0033	< 1.0	--	< 0.0093	< 0.0067	< 0.080	**0.0081**	< 0.0029	NA	< 0.0041	< 0.0085	< 0.011	< 0.0033	< 0.013	ND
		4.5	5	07/17/10	**0.012**	**0.026**	< 0.012	< 0.0040	< 0.0040	**0.016**	< 0.0026	< 0.010	< 0.0040	< 0.0040	< 0.015	< 0.0035	< 1.1	--	NA	NA	< 0.085	< 0.0044	< 0.0031	NA	< 0.0044	< 0.0092	< 0.0021	< 0.0035	< 0.014	ND
		4.5	5	10/28/10	**0.0087**	< 0.0093	< 0.013	< 0.0043	< 0.0043	< 0.0082	**0.014**	< 0.011	< 0.0042	< 0.0043	**0.050**	**0.0096**	< 1.1		< 0.011	< 0.0077	< 0.091	**0.017**	**0.036**	NA	< 0.0046	< 0.0097	< 0.012	**0.013**	**0.036**	ND
P8SG-01		4.5	5	10/30/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	**0.78**	< 328	--	NA	NA	**0.44**	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	**0.74**	ND
P8SG-02		5	5	01/11/10	< 0.0040	< 0.0080	**0.14**	**0.042**	**0.030**	**0.011**	**0.0061**	< 0.0092	< 0.0036	< 0.0037	< 0.014	**0.024**	**12**	**0.0018**	< 0.0091	**0.0072**	< 0.078	< 0.0050	**0.042**	NA	< 0.0040	< 0.0083	< 0.010	**0.048**	**0.10**	ND
P8SG-03		5	5	01/11/10	< 0.0040	< 0.0079	**0.092**	**0.028**	**0.023**	**0.027**	**0.027**	< 0.0092	< 0.0036	< 0.0036	< 0.014	**0.032**	< 0.96	--	< 0.0090	**0.014**	< 0.077	**0.092**	**0.083**	NA	< 0.0039	**0.011**	< 0.010	**0.059**	**0.12**	ND
P9SG-01	1	4.5	5	10/29/09	**0.26**	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	NA	NA	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
	3	4.5	5	10/29/09	**0.28**	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
	7	4.5	5	10/29/09	**0.27**	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	NA	NA	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
		4.5	5	10/30/09	**0.36**	NA	< 0.012	< 0.004	< 0.004	**0.008**	**0.0039**	< 0.01	< 0.004	**0.0040**	NA	**0.0036**	< 1.7	--	< 0.01	< 0.0072	< 0.085	< 0.0055	**0.011**	NA	< 0.0044	< 0.0091	< 0.011	**0.0047**	**0.016**	ND
P9SG-02		5.5	6	10/29/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P9SG-03		6.5	7	10/29/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P9SG-04		5.5	6	10/29/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
P9SG-05		4	4	01/08/10	**0.038**	< 0.0079	**0.16**	**0.051**	**0.055**	< 0.0069	**0.0088**	< 0.0091	< 0.0036	< 0.0036	< 0.014	**0.077**	**14**	**0.0021**	< 0.0090	**0.010**	< 0.077	< 0.0050	**0.14**	NA	< 0.0039	< 0.0082	< 0.010	**0.13**	**0.30**	ND
P9SG-06		4	4	01/08/10	**0.023**	< 0.033	**0.18**	**0.061**	**0.074**	**0.065**	**0.028**	< 0.038	< 0.015	< 0.015	< 0.058	**0.19**	**1,000**	**0.15**	< 0.038	< 0.027	< 0.32	**0.039**	**0.45**	NA	< 0.017	< 0.035	< 0.043	**0.25**	**0.61**	ND
SPSGP-01		4.5	5	10/30/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
		4.5	5	11/24/09	< 0.0041	NA	< 0.011	< 0.0037	< 0.0037	**0.045**	< 0.0024	< 0.0095	< 0.0037	< 0.0038	NA	< 0.0033	< 1	--	< 0.0093	**0.014**	< 0.04	< 0.0052	< 0.0029	NA	< 0.0041	< 0.0085	**0.016**	< 0.0033	< 0.013	ND
		4.5	5	4/9/2010	< 0.0045	< 0.0089	< 0.012	< 0.0041	< 0.0041	**0.023**	< 0.0026	< 0.010	< 0.0040	< 0.0041	< 0.016	< 0.0036	< 1.1	--	< 0.010	< 0.0073	< 0.086	< 0.0056	< 0.0031	NA	< 0.0044	< 0.0093	< 0.012	< 0.0036	< 0.014	ND
		4.5	5	07/17/10	< 0.0041	< 0.0081	< 0.011	< 0.0037	< 0.0037	**0.032**	< 0.0024	< 0.0093	**0.0049**	**0.0044**	< 0.014	< 0.0032	**2.4**	**3.66×10^{-4}**	NA	NA	< 0.078	< 0.0051	< 0.0028	NA	< 0.0040	< 0.0084	< 0.010	< 0.0032	< 0.013	ND
		4.5	5	10/28/10	< 0.0046	< 0.0092	< 0.013	< 0.0042	< 0.0042	< 0.0081	< 0.0027	< 0.011	**0.0044**	< 0.0042	< 0.016	< 0.0037	< 1.1		< 0.010	< 0.0075	< 0.089	< 0.0058	< 0.0032	NA	< 0.0046	< 0.0096	< 0.012	< 0.0037	< 0.015	ND

Table 28
Soil Gas Analytical Results
Pier 70 Environmental Site Investigation
San Francisco, California

				Chemical Name	1,1,1-TCA	1,1-DFA	1,2,4-TMB	1,3,5-TMB	4-Ethyl-toluene	Acetone	Benzene	Carbon Disulfide	Chloroform	Dichloro-difluoro-methane	Ethanol	Ethyl Benzene	Methane		Methyl butyl ketone	Methyl ethyl ketone	Naph-thalene	PCE	Toluene	TPHg	TCE	Trichloro-fluoro-methane	Vinyl Acetate	Xylene, o-	Xylenes, m,p-	All other VOCs
				ESL Residential	**460**	**NE**	**NE**	**NE**	**NE**	**660**	**0.084**	**NE**	**0.46**	**NE**	**NE**	**0.98**	**NE**	**1.25****	**NE**	**1,000**	**0.072**	**0.41**	**63**	**10**	**1.2**	**NE**	**NE**	**NE**	**NE**	**NE**
				ESL Commercial	**1,300**	**NE**	**NE**	**NE**	**NE**	**1,800**	**0.28**	**NE**	**1.5**	**NE**	**NE**	**3.3**	**NE**	**5.0*****	**NE**	**2,900**	**0.24**	**1.4**	**180**	**29**	**4.1**	**NE**	**NE**	**NE**	**NE**	**NE**
				Unit	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**%**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**
Location ID	**Purge Volume**	**Start Depth**	**End Depth**	**Sample Date**																										
SPSGP-02		4.5	5	10/30/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	NA	NA	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
		4.5	5	11/24/09	< 0.004	NA	< 0.011	< 0.0036	< 0.0036	**0.013**	< 0.0023	< 0.0092	< 0.0036	< 0.0036	NA	< 0.0032	< 0.96	--	< 0.009	< 0.0065	< 0.039	**0.0076**	< 0.0028	NA	< 0.0039	< 0.0083	< 0.01	< 0.0032	< 0.013	ND
		4.5	5	04/09/10	< 0.0046	< 0.0091	< 0.012	< 0.0042	< 0.0042	**0.015**	< 0.0027	< 0.011	< 0.0041	< 0.0042	< 0.016	< 0.0037	< 1.1	--	< 0.010	< 0.0075	< 0.089	**0.0062**	< 0.0032	NA	< 0.0045	< 0.0095	< 0.012	< 0.0037	< 0.015	ND
		4.5	5	07/17/10	< 0.0046	< 0.0091	< 0.012	< 0.0042	< 0.0042	**0.015**	< 0.0027	< 0.011	**0.0056**	< 0.0042	< 0.016	< 0.0037	< 1.1	--	NA	NA	< 0.089	**0.013**	< 0.0032	NA	**0.0049**	< 0.0095	< 0.012	< 0.0037	< 0.015	ND
		4.5	5	10/28/10	< 0.0042	**0.015**	< 0.011	< 0.0038	< 0.0038	< 0.0074	< 0.0025	< 0.0097	< 0.0038	< 0.0038	**0.016**	**0.0041**	< 1.0		< 0.0095	< 0.0069	< 0.081	**0.012**	**0.011**	NA	< 0.0042	< 0.0087	< 0.011	**0.0035**	< 0.013	ND
SPSGP-03		4.5	5	10/30/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	NA	NA	NA	NA	< 0.1	< 0.1	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
		4.5	5	11/24/09	< 0.004	NA	< 0.011	< 0.0036	< 0.0036	**0.0083**	< 0.0023	< 0.0091	< 0.0036	< 0.0036	NA	< 0.0032	< 0.96	--	< 0.009	< 0.0065	< 0.038	**0.0098**	< 0.0028	NA	< 0.0039	< 0.0082	< 0.01	< 0.0032	< 0.013	ND
		4.5	5	04/09/10	< 0.0045	< 0.0089	< 0.012	< 0.0040	< 0.0040	**0.012**	< 0.0026	< 0.010	< 0.0040	< 0.0041	< 0.015	< 0.0036	< 1.1	--	< 0.010	< 0.0073	< 0.086	< 0.0056	< 0.0031	NA	< 0.0044	< 0.0092	< 0.012	< 0.0036	< 0.014	ND
		4.5	5	07/17/10	< 0.0041	< 0.0082	< 0.011	< 0.0037	< 0.0037	**0.043**	< 0.0024	< 0.0094	< 0.0037	**0.0040**	< 0.014	< 0.0033	< 0.99	--	NA	NA	< 0.079	**0.0088**	< 0.0028	NA	< 0.0041	< 0.0085	< 0.011	< 0.0033	< 0.013	ND
		4.5	5	10/28/10	< 0.0044	< 0.0087	< 0.012	< 0.0040	< 0.0040	**0.011**	< 0.0026	< 0.010	< 0.0039	< 0.0040	**0.021**	< 0.0035	< 1.1		< 0.0099	< 0.0071	< 0.084	**0.015**	< 0.0030	NA	< 0.0043	< 0.0090	< 0.011	< 0.0035	< 0.014	ND
SPSGP-04		4.5	5	10/30/09	< 0.1	NA	NA	NA	NA	NA	< 0.1	NA	< 0.1	< 0.1	NA	< 0.1	< 328	--	NA	NA	< 0.1	**0.15**	< 0.2	NA	< 0.1	< 0.1	NA	< 0.1	< 0.2	ND
	1	4.5	5	11/06/09	< 0.0039	NA	**0.012**	< 0.0035	**0.0040**	**0.017**	< 0.0023	< 0.009	< 0.0035	**0.0048**	NA	**0.0064**	NA	NA	< 0.0088	**0.0099**	< 0.075	**0.19**	**0.017**	NA	< 0.0039	**0.027**	< 0.01	**0.010**	**0.026**	ND
	3	4.5	5	11/06/09	< 0.0043	NA	< 0.012	< 0.0038	< 0.0038	**0.025**	< 0.0025	< 0.0097	< 0.0038	< 0.0039	NA	**0.0058**	NA	NA	< 0.0096	< 0.0069	< 0.082	**0.21**	**0.017**	NA	< 0.0042	**0.050**	< 0.011	**0.0093**	**0.025**	ND
	7	4.5	5	11/06/09	< 0.0042	NA	< 0.011	< 0.0038	< 0.0038	**0.028**	< 0.0025	< 0.0097	< 0.0038	< 0.0038	NA	**0.0060**	NA	NA	< 0.0095	**0.025**	< 0.081	**0.21**	**0.016**	NA	< 0.0042	**0.048**	< 0.011	**0.0095**	**0.026**	ND
		4.5	5	11/24/09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.0	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND
		4.5	5	4/9/2010	< 0.0043	< 0.0084	< 0.012	< 0.0038	< 0.0038	**0.013**	< 0.0025	< 0.0097	< 0.0038	< 0.0039	< 0.015	< 0.0034	< 1.0	--	< 0.0096	< 0.0069	< 0.082	**0.088**	< 0.0029	NA	< 0.0042	**0.013**	< 0.011	< 0.0034	< 0.014	ND
DUP1-2010-04-09		4.5	5	4/9/2010	< 0.0044	< 0.0087	< 0.012	< 0.0040	< 0.0040	**0.064**	< 0.0026	< 0.010	< 0.0039	< 0.0040	**0.033**	< 0.0035	< 1.1	--	< 0.0099	**0.0072**	< 0.084	**0.097**	< 0.0030	NA	< 0.0043	**0.016**	< 0.011	< 0.0035	< 0.014	ND
		4.5	5	07/17/10	< 0.0038	< 0.0075	< 0.010	< 0.0034	< 0.0034	**0.016**	< 0.0022	< 0.0087	< 0.0034	< 0.0034	**0.018**	< 0.0030	**1.3**	**1.98 x 10^{-5}**	NA	NA	< 0.073	< 0.0047	**0.0066**	NA	< 0.0037	< 0.0078	< 0.0098	< 0.0030	< 0.012	chloromethane = 0.015 Other VOC = ND
DUP1-2010-07-15		4.5	5	07/15/10	< 0.0067	< 0.013	< 0.018	< 0.0060	< 0.0060	**0.015**	< 0.0039	< 0.015	< 0.0060	< 0.0061	< 0.023	< 0.0053	**4.3**	**6.6 x 10^{-4}**	< 0.015	< 0.011	< 0.13	**0.22**	< 0.0046	NA	< 0.0066	**0.023**	< 0.017	< 0.0053	< 0.021	1,2-Dichloroethane = 0.0075; Other VOC = ND
		4.5	5	10/28/10	< 0.0043	**0.68**	< 0.012	< 0.0039	< 0.0039	< 0.0075	**0.012**	< 0.0098	< 0.0039	**0.0042**	< 0.015	**0.0038**	< 1.0	--	< 0.0097	< 0.0070	< 0.083	**0.11**	**0.038**	NA	< 0.0042	**0.027**	< 0.011	**0.0044**	**0.015**	ND
DUP1-2010-10-28		4.5	5	10/28/10	< 0.0042	< 0.0083	< 0.011	< 0.0038	< 0.0038	**0.012**	< 0.0025	< 0.0096	< 0.0038	< 0.0038	**0.016**	< 0.0033	**1.3**	**1.98 x 10^{-5}**	< 0.0095	< 0.0068	< 0.081	< 0.0052	< 0.0029	NA	< 0.0041	< 0.0087	< 0.011	< 0.0033	< 0.013	ND

Notes:

Feet bgs - feet below ground surface

All results are reported in micrograms per Liter (µg/L).

1,1 DFA - 1,1-Difluoroethane　1,1,1-TCA - 1,1,1-Trichloroethane　1,2,4-TMB - 1,2,4-Trimethylbenzene　1,3,5-TMB - 1,3,5-

PCE - Tetrachloroethene　TCE - Trichloroethene

TPHg - Total Petroleum Hydrocarbons as Gasoline Range (C7-C12), EPA Method 8015M

VOCs - volatile organic compounds

ESL (Res) - Residential Soil Gas Environmental Screening Level for Potential Indoor Air Vapor Intrusion (RWQCB, 2008), Table E-2

ESL (Com) - Commercial Soil Gas Environmental Screening Level for Potential Indoor Air Vapor Intrusion (RWQCB, 2008), Table E-2

Bold indicates results detected above laboratory reporting limits

Blue shading indicates result exceeds both residential and commercial ESLs.

gray shading indicates result exceeds residential ESL

< 100 - not detected at or above the laboratory reporting limit of 100 (µg/L

ND - not detected at or above the laboratory reporting limit

NE - not established

* - Duplicate s indicates result exceeds residential ESL

** Title 27 Regulations the concentration of methane gas must not exceed 1.25 % by volume in air within any portion of any on-site structures.

*** Title 27 Regulations the concentration of methane gas migrating from the disposal site must not exceed 5% by volume in air at the disposal site permitted facility boundary or an alternative boundary approved in accordance with Section 20925.

NA - not applicable or not analyzed

Results presented only include locations with detections above laboratory reporing limits.

-- - Not calculated

Table 29
Field QA/QC Results - Metals
Pier 70 Environmental Site Investigation
San Francisco, California

Sample Name	Location ID	Chemical Name	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
		Unit	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
		Sample Date																	
ER1-2009-08-26	EB	08/26/09	NA	NA	NA	NA	< 5.0	< 5.0	NA	NA	**0.77 J**	NA	NA	< 5.0	NA	NA	NA	NA	**75**
ER2-2009-08-26	EB	08/26/09	NA	NA	NA	NA	< 5.0	**1.4 J**	NA	NA	**0.69 J**	NA	NA	< 5.0	NA	NA	NA	NA	**42**
ER1-2009-08-27	EB	08/27/09	< 10	< 5.0	< 5.0	< 2.0	< 5.0	< 5.0	< 5.0	< 5.0	< 3.0	**0.050 J**	< 5.0	< 5.0	< 10	< 5.0	< 10	< 5.0	< 20
ER2-2009-08-27	EB	08/27/09	< 10	< 5.0	< 5.0	< 2.0	< 5.0	< 5.0	< 5.0	**54**	< 3.0	< 0.20	< 5.0	< 5.0	< 10	< 5.0	< 10	< 5.0	**36**
ER2-2009-08-28	EB	08/28/09	< 10	**3.0 J**	< 5.0	< 2.0	< 5.0	< 5.0	< 5.0	< 5.0	< 3.0	**0.039 J**	**2.3 J**	< 5.0	< 10	< 5.0	< 10	< 5.0	< 20
ER1-2009-08-28	EB	08/28/09	< 10	< 5.0	< 5.0 UJ	< 2.0	< 5.0	< 5.0	< 5.0	< 5.0	< 3.0 UJ	< 0.20	< 5.0	< 5.0	< 10	< 5.0	< 10	< 5.0	< 20
ER1-2009-08-31	EB	08/31/09	< 10	< 5.0	**9.6**	< 2.0	< 5.0	< 5.0	< 5.0	**3.9 J**	< 3.0	< 0.20	< 5.0	< 5.0	< 10	< 5.0	< 10	< 5.0	**22**
ER1-2009-09-02	EB	09/02/09	< 10	**4.3 J**	**4.3 J**	< 2.0	< 5.0	< 5.0	< 5.0	< 5.0	< 3.0	**0.11 J**	< 5.0	< 5.0	< 10	< 5.0	< 10	< 5.0	**6.8 J**
ER1-2009-09-03	EB	09/03/09	< 10	< 5.0	**4.5 J**	< 2.0	< 5.0	**1.4 J**	**0.84 J**	< 5.0	< 3.1	< 0.20	**2.9 J**	**4.1 J**	< 10	< 5.0	**6.7 J**	**0.81 J**	**14 J**
ER1-2009-09-08	EB	09/08/09	< 10	**1.2 J**	**21**	< 2.0	< 5.0	< 5.0	< 5.0	**1.6 J**	< 3.1	< 0.20	< 5.0	< 5.0	**2.6 J**	**1.7 J**	< 10	< 5.0	**20**
ER2-2009-09-08	EB	09/08/09	< 10	< 5.0	**13**	< 2.0	< 5.0	**1.0 J**	**1.1 J**	< 5.0	**1.4 J**	< 0.20	< 5.0	**2.3 J**	< 10	< 5.0	< 10	< 5.0	**37**
ER-1-2009-09-09	EB	09/09/09	< 10	< 5.0	**1.3 J**	< 2.0	< 5.0	< 5.0	< 5.0	< 5.0	< 3.0	< 0.20	< 5.0	< 5.0	< 10	< 5.0	< 10	< 5.0	**24**
ER2-2009-09-09	EB	09/09/09	< 10	< 5.0	**4.8 J**	< 2.0	< 5.0	< 5.0	< 5.0	< 5.0	< 3.0	< 0.20	**1.4 J**	< 5.0	< 10	< 5.0	< 10	< 5.0	**15 J**
ER1-2009-09-10	EB	09/10/09	< 10	< 5.0	< 5.0	< 2.0	< 5.0	< 5.0	< 5.0	**6.1**	< 3.1	< 0.20	< 5.0	**1.2 J**	< 10	< 5.0	**2.7 J**	< 5.0	**13 J**
SW1-2009-09-11	FB	09/11/09	< 10	< 5.0	< 5.0	< 2.0	< 5.0	< 5.0	**0.55 J**	< 5.0	< 3.1	< 0.20	< 5.0	**1.9 J**	**8.2 J**	< 5.0	**3.5 J**	< 5.0	< 20
ER1-2009-12-7	EB	12/07/09	NA	NA	NA	NA	< 5.0	**5.0 J**	NA	NA	**2.5 J**	NA	NA	< 5.0	NA	NA	NA	NA	< 20
EB1-2009-12-8	EB	12/08/09	NA	< 5.0	NA	NA	< 5.0	< 5.0	< 5.0	**11**	< 3.0	< 0.20	NA	< 5.0	NA	NA	NA	NA	**19 J**
ER1-2009-12-9	EB	12/09/09	NA	< 5.0	NA	NA	< 5.0	< 5.0	< 5.0	**2.7 J**	< 3.0	< 0.20	NA	< 5.0	NA	NA	NA	NA	**43**
ER1-2009-12-10	EB	12/10/09	NA	< 5.0	NA	NA	< 5.0	< 5.0	**1.1 J**	< 5.0	< 3.1	< 0.20	NA	**3.7 J**	NA	NA	NA	NA	**7.9 J**
ER1-2009-12-14	EB	12/14/09	NA	< 5.0	NA	NA	< 5.0	< 5.0	**1.1 J**	< 5.0	< 3.1	< 0.20	NA	< 5.0 J U	NA	NA	NA	NA	< 20
ERI-2009-12-17	EB	12/17/09	NA	< 5.0	NA	NA	< 5.0	< 5.0	< 5.0	< 5.0	**1.3 J**	< 0.20	NA	< 5.0	NA	NA	NA	NA	**63**

Notes:
All results are reported in micrograms per Liter (µg/L).
Samples analyzed using EPA Method 6010.
NA - Not analyzed
bold - indicates results exceeds laboratory reporting limit
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.
U - The analyte was analyzed for, but was not detected above, the reported sample quantitation limit.

Table 30
Field QA/QC Results - TPH and other Organics
Pier 70 Environmental Site Investigation
San Francisco, California

			Gen Chem	TPH		VOC					PAH/SVOC				Dioxin				
		Analytical Method	SM4500S2D	SW8015M	SW8015M	SW8260M	SW8260M	SW8260M	SW8260M	SW8260M	SW8270C -SIM	SW8270C -SIM	SW8270C -SIM	SW8270C -SIM	SW8290	SW8290	SW8290	SW8290	SW8290
		Chemical Name	Sulfide	TPHd	TPHg	Acetone	Chloroform	Methylene Chloride	Toluene	Naphthalene	Naphthalene	Pyrene	Fluoranthene	Phenanthrene	Octachloro dibenzo-p-dioxin (OCDD)	1,2,3,4,6,7,8-Heptachloro dibenzo-P-Dioxin	Heptachloro dibenzo-p-dioxins (HpCDD), Total	2,3,7,8-Tetrachloro dibenzofuran	Total TCDF
		Unit	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Sample Name	**Location ID**	**Sample Date**																	
ER1-2009-08-26	EB	08/26/09	NA	**12 J**	**11 J**	NA	NA	NA	NA	NA	**0.04 J**	< 0.1	< 0.1	< 0.1	NA	NA	NA	NA	NA
ER2-2009-08-26	EB	08/26/09	NA	< 50	**13 J**	NA	NA	NA	NA	NA	**0.05 J**	< 0.1	< 0.1	< 0.1	NA	NA	NA	NA	NA
ER1-2009-08-27	EB	08/27/09	**60**	< 50	**8.6 J**	**1.5 J**	< 0.5	**1.4 J**	< 0.5	< 2.0	< 0.1	< 0.1	< 0.1	< 0.1	NA	NA	NA	NA	NA
ER2-2009-08-27	EB	08/27/09	NA	< 50	**9.4 J**	**2.0 J**	< 0.5	**1.4 J**	**0.2 J**	< 2.0	**0.05 J**	< 0.09	< 0.09	< 0.09	NA	NA	NA	NA	NA
ER1-2009-08-28	EB	08/28/09	< 40	< 50	**11 J**	**3.9 J**	< 0.5	**1.2 J**	< 0.5	< 2.0	< 0.1	**0.03 J**	**0.02 J**	**0.04 J**	NA	NA	NA	NA	NA
ER2-2009-08-28	EB	08/28/09	NA	< 50	**9.2 J**	**2.5 J**	< 0.5	< 10	**0.2 J**	< 2.0	**0.04 J**	< 0.1	< 0.1	< 0.1	NA	NA	NA	NA	NA
ER1-2009-08-31	EB	08/31/09	< 40	< 50	**11 J**	**5.3 J**	< 0.5	< 10	< 0.5	< 2.0	< 0.1	< 0.1	**0.02 J**	< 0.1	NA	NA	NA	NA	NA
ER1-2009-09-02	EB	09/02/09	NA	**8.5 J**	**14 J**	**12**	< 0.5	**0.6 J**	< 0.5	< 2.0	< 0.1	< 0.1	< 0.1	< 0.1	NA	NA	NA	NA	NA
ER1-2009-09-03	EB	09/03/09	NA	< 50	**18 J**	NA	NA	NA	NA	NA	< 0.2	< 0.2	< 0.2	< 0.2	NA	NA	NA	NA	NA
ER1-2009-09-08	EB	09/08/09	< 40	< 50	**28 J**	**1.7 J**	< 0.5	**2.1 J**	< 0.5	< 2.0	< 0.1	< 0.1	< 0.1	< 0.1	NA	NA	NA	NA	NA
ER2-2009-09-08	EB	09/08/09	NA	< 50	**30 J**	< 10	< 0.5	**0.9 J**	< 0.5	< 2.0	< 0.1	< 0.1	< 0.1	< 0.1	NA	NA	NA	NA	NA
ER-1-2009-09-09	EB	09/09/09	< 40	< 50	**23 J**	**1.7 J**	< 0.5	**0.7 J**	< 0.5	< 2.0	< 0.1	< 0.1	< 0.1	< 0.1	NA	NA	NA	NA	NA
ER2-2009-09-09	EB	09/09/09	NA	**8.8 J**	**27 J**	**2.6 J**	< 0.5	**0.7 J**	< 0.5	< 2.0	< 0.1	< 0.1	< 0.1	< 0.1	NA	NA	NA	NA	NA
ER1-2009-09-10	EB	09/10/09	NA	**9.3 J**	< 50	**2.3 J**	< 0.5	< 10	**0.1 J**	< 2.0	< 0.1	< 0.1	< 0.1	< 0.1	NA	NA	NA	NA	NA
ER1-2009-12-7	EB	12/07/09	NA	**11 J**	**7.3 J**	NA	NA	NA	NA	NA	**0.02 J**	< 0.1	< 0.1	< 0.1	NA	NA	NA	NA	NA
EB1-2009-12-8	EB	12/08/09	NA	**8.3 J**	**7.8 J**	NA	NA	NA	NA	NA	**0.02 J**	< 0.1	< 0.1	**0.03 J**	NA	NA	NA	NA	NA
ER1-2009-12-9	EB	12/09/09	NA	**11 J**	**12 J**	**3.9 J**	< 0.5	**0.4 J**	< 0.5	< 2.0	**0.02 J**	< 0.1	< 0.1	< 0.1	NA	NA	NA	NA	NA
ER1-2009-12-10	EB	12/10/09	NA	**11 J**	**30 J**	NA	NA	NA	NA	NA	< 0.1	< 0.1	< 0.1	< 0.1	NA	NA	NA	NA	NA
ER1-2009-12-14	EB	12/14/09	NA	< 50	< 50 J U	NA	NA	NA	NA	NA	< 0.1	< 0.1	< 0.1	< 0.1	< 0.0000013 J U	< 0.00000058 J U	< 0.00000058 J U	**0.00000158 J**	**0.00000329 J**
ERI-2009-12-17	EB	12/17/09	NA	< 50	**18 J**	NA	NA	NA	NA	NA	< 0.1	< 0.1	< 0.1	< 0.1	NA	NA	NA	NA	NA
SW1-2009-09-11	FB	09/11/09	< 40	**16 J**	< 50	**1.6 J**	**0.1 J**	**0.4 J**	< 0.5	< 2.0	< 0.1	< 0.1	< 0.1	< 0.1	**0.0000303 J**	**0.00000307 J**	**0.00000628 J**	**0.0000007 J**	**0.0000007 J**
TRIP1-2009-08-27	TB	08/27/09	NA	NA	NA	< 10	< 0.5	< 10	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRIP1-2009-08-28	TB	08/28/09	NA	NA	NA	< 10	< 0.5	< 10	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRIP2-2009-08-28	TB	08/28/09	NA	NA	NA	< 10	< 0.5	< 10	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRIP1-2009-08-31	TB	08/31/09	NA	NA	NA	< 10	< 0.5	< 10	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRIP1-2009-09-02	TB	09/02/09	NA	NA	NA	< 10	< 0.5	< 10	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRIP1-2009-09-03	TB	09/03/09	NA	NA	NA	< 10	< 0.5	< 10	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRIP1-2009-09-08	TB	09/08/09	NA	NA	NA	< 10	< 0.5	< 10	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRIP1-2009-09-09	TB	09/09/09	NA	NA	NA	< 10	< 0.5	**0.5 J**	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRIP1-2009-09-10	TB	09/10/09	NA	NA	NA	< 10	< 0.5	< 10	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRIP2-2009-09-10	TB	09/10/09	NA	NA	NA	< 10	< 0.5	< 10	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRIP1-2009-09-11	TB	09/11/09	NA	NA	NA	< 10	< 0.5	< 10	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRIP1-2009-10-5	TB	10/05/09	NA	NA	NA	< 10	**0.1 J**	< 10	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRIP1-2009-10-6	TB	10/06/09	NA	NA	NA	< 10	**0.1 J**	< 10	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TB	TB	10/26/09	NA	NA	**12 J**	**1.5 J**	< 0.5	< 10	**0.1 J**	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRIP1-2009-12-9	TB	12/09/09	NA	NA	NA	< 10	< 0.5	< 10	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRIP1-2009-12-16	TB	12/16/09	NA	NA	NA	< 10	< 0.5	**0.9 J**	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRIP-1-2010-3-17	TB	03/17/10	NA	NA	NA	< 10	< 0.5	< 10	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRIP-1-2010-3-18	TB	03/18/10	NA	NA	NA	< 10	< 0.5	**0.1**	< 0.5	< 2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
All results are reported in micrograms per Liter (µg/L).
NA - not analyzed
PAH - Polycyclic aromatic hydrocarbons
SVOC - Semi Volatile Organic Compounds, EPA 8260B
TPHg - Total Petroleum Hydrocarbons as Gasoline Range (C7-C12), EPA Method 8015M
TPHd - Total Petroleum Hydrocarbons as Diesel Range (C10-C24), EPA Method 8015M
TPHmo - Total Petroleum Hydrocarbons as Motor Oil (C24-C36), EPA Method 8015M
VOCs - Volatile Organic Compounds, EPA 8260B
PCB - polychlorinated biphynols
bold - indicates that result exceeds laboratory reporting limits
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, refer to the specific analytical report for the rationale behind the qualification.
U - The analyte was analyzed for, but was not detected above, the reported sample quantitation limit.

Table 31
Total Excess Lifetime Cancer Risk and Non-cancer Hazard Summary
Pier 70 Master Plan Area
San Francisco, California

	Construction Worker (dry trench)		Construction Worker (wet trench)		Commercial Worker		Resident			Recreational Park User		
Parcel or Area	**Cancer Risk**	**HI**	**Cancer Risk**	**HI**	**Cancer Risk**	**HI**	**Cancer Risk**	**Adult HI**	**Child HI**	**Cancer Risk**	**Adult HI**	**Child HI**
1	**3.E-06**	**46**	a	a	**9.E-06**	0.4	**3.E-05**	0.7	**5**	----	----	----
2	**1.E-05**	**89**	**3.E-05**	**115**	**9.E-05**	**2**	----	----	----	----	----	----
3	**5.E-06**	**214**	**9.E-06**	**214**	**9.E-06**	**2**	**3.E-05**	**3**	**17**	----	----	----
4	**1.E-05**	**64**	**1.E-05**	**99**	**2.E-04**	**2**	----	----	----	----	----	----
5	**1.E-06**	**3**	a	a	**2.E-06**	0.2	----	----	----	----	----	----
6	**1.E-05**	**27**	**2.E-05**	**29**	**4.E-06**	0.3	----	----	----	----	----	----
7	**4.E-06**	**11**	a	a	3.E-08	0.1	----	----	----	----	----	----
8	1.E-07	0.3	1.E-07	0.4	5.E-07	0.004	----	----	----	----	----	----
9	**4.E-06**	**47**	**4.E-05**	**138**	**2.E-05**	**2**	----	----	----	----	----	----
Central Plaza Park	**4.E-06**	**7**	**1.E-05**	**17**	----	----	----	----	----	**2.E-05**	0.1	1
Crane Cove Park	**5.E-06**	**57**	**7.E-06**	**68**	----	----	----	----	----	**5.E-05**	0.5	**5**
Slipways Park	**3.E-06**	**10**	**1.E-05**	**19**	----	----	----	----	----	**3.E-05**	0.2	**2**
MGP Investigation Area	**3.E-04**	**21**	**3.E-04**	**23**	**7.E-05**	0.4	----	----	----	**1.E-04**	0.2	**2**

Notes:

MGP = Manufactured Gas Plant

HI = Hazard Index

---- = Not evaluated for specific receptor based on future land use of parcel.

a = Not evaluated because groundwater data was not available. Therefore, the risks and hazards are equivalent under the dry trench and wet trench scenarios for the construction worker.

Bold entries identify cancer risk greater than one in a million or a hazard quotient or index greater than one.

For each parcel, total excess lifetime cancer risk and noncancer hazards were calculated by summing the cancer risks and noncancer hazard quotients from soil and the higher of the cancer risks and noncancer hazard from either soil gas or groundwater.

Residential and recreational cancer risk were calculated assuming six years of exposure as a child and 24 years of exposure as an adult.

Table 32
Excess Lifetime Cancer Risk and Non-cancer Hazard Summary for Soil
Pier 70 Master Plan Area
San Francisco, California

Parcel or Area	Construction Worker		Commercial Worker		Resident			Recreational Park User		
	Cancer Risk	HI	Cancer Risk	HI	Cancer Risk	Adult HI	Child HI	Cancer Risk	Adult HI	Child HI
1	**3.E-06**	**46**	**9.E-06**	0.4	**3.E-05**	0.7	**5**	**----**	**----**	**----**
2	**1.E-05**	**89**	**8.E-05**	**2**	**----**	**----**	**----**	**----**	**----**	**----**
3	**5.E-06**	**214**	**9.E-06**	**2**	**3.E-05**	**3**	**17**	**----**	**----**	**----**
4	**1.E-05**	**64**	**1.E-04**	1	**----**	**----**	**----**	**----**	**----**	**----**
5	**1.E-06**	**3**	**2.E-06**	0.2	**----**	**----**	**----**	**----**	**----**	**----**
6	**1.E-05**	**27**	**4.E-06**	0.3	**----**	**----**	**----**	**----**	**----**	**----**
7	**4.E-06**	**11**	3.E-08	0.1	**----**	**----**	**----**	**----**	**----**	**----**
8	6.E-08	0.3	a	a	----	----	----	**----**	**----**	**----**
9	**4.E-06**	**47**	**2.E-05**	**2**	**----**	**----**	**----**	**----**	**----**	**----**
Central Plaza Park	**4.E-06**	**7**	**----**	**----**	**----**	**----**	**----**	**2.E-05**	0.1	1
Crane Cove Park	**5.E-06**	**57**	**----**	**----**	**----**	**----**	**----**	**5.E-05**	0.5	**5**
Slipways Park	**3.E-06**	**10**	**----**	**----**	**----**	**----**	**----**	**3.E-05**	0.2	**2**
MGP Investigation Area	**3.E-04**	**21**	**7.E-05**	0.4	**----**	**----**	**----**	**1.E-04**	0.2	**2**

Notes:
MGP = Manufactured Gas Plant
HI = Hazard Index
---- = Not evaluated for specific receptor based on future land use of parcel.
a = Not evaluated because soil data for 0-2 ft bgs depth interval was not available.
Bold entries identify cancer risk greater than one in a million or a hazard quotient or index greater than one.
Total cancer risk and HI represent total contributions from soil and groundwater. As a conservative approach, the maximum value from soil or groundwater was used in the calculation of the total cancer risk or HI.

Table 33
Excess Lifetime Cancer Risk and Non-cancer Hazard Summary for Soil Gas
Pier 70 Master Plan Area
San Francisco, California

	Construction Worker		Commercial Worker		Resident		Recreational Park User	
Parcel or Area	**Cancer Risk**	**HI**	**Cancer Risk**	**HI**	**Cancer Risk**	**Adult/Child HI**	**Cancer Risk**	**Adult/Child HI**
1	1.E-08	0.01	8.E-08	0.003	**1.E-06**	0.03	----	----
2	1.E-07	0.02	8.E-07	0.004	----	----	----	----
3	a	a	a	a	a	a	----	----
4	2.E-08	0.01	1.E-07	0.003	----	----	----	----
5	b	0.0002	b	0.00006	----	----	----	----
6	4.E-09	0.006	3.E-08	0.002	----	----	----	----
7	c	c	c	c	----	----	----	----
8	6.E-08	0.01	5.E-07	0.004	----	----	----	----
9	7.E-09	0.01	5.E-08	0.003	----	----	----	----
Central Plaza Park	c	c	----	----	----	----	c	c
Crane Cove Park	c	c	----	----	----	----	c	c
Slipways Park	2.E-10	0.0001	----	----	----	----	3.E-11	0.0000004
MGP Investigation Area	1.E-08	0.009	7.E-08	0.003	----	----	1.E-09	0.00003

Notes:
MGP = Manufactured Gas Plant
HI = Hazard Index
---- = Not evaluated for specific receptor based on future land use of parcel.
a = Not evaluated because chemicals were not detected in soil gas samples for the specified parcel.
b = Not evaluated because COPCs are not carcinogens.
c = Not evaluated because soil gas data was not available for specified parcel.
Bold entries identify cancer risk greater than one in a million or a hazard quotient or index greater than one.

Table 34

Excess Lifetime Cancer Risk and Non-cancer Hazard Summary for Groundwater

Pier 70 Master Plan Area

San Francisco, California

	Construction Worker (dry trench)		Construction Worker (wet trench)		Commercial Worker		Resident		Recreational Park User	
Parcel or Area	**Cancer Risk**	**HI**	**Cancer Risk**	**HI**	**Cancer Risk**	**HI**	**Cancer Risk**	**Adult/Child HI**	**Cancer Risk**	**Adult/Child HI**
1	a	a	a	a	a	a	a	a	----	----
2	2.E-12	0.0000007	**2.E-05**	**26**	3.E-09	0.0009	----	----	----	----
3	1.E-12	0.0000006	**4.E-06**	0.12	2.E-09	0.0009	2.E-08	0.1	----	----
4	7.E-09	0.0007	**3.E-06**	**34**	**1.E-05**	0.3	----	----	----	----
5	a	a	a	a	a	a	----	----	----	----
6	1.E-13	0.0000002	**2.E-06**	**2.26**	2.E-10	0.001	----	----	----	----
7	a	a	a	a	a	a	----	----	----	----
8	6.E-13	0.0000001	2.E-08	0.02	8.E-10	0.0008	----	----	----	----
9	8.E-11	0.00002	**4.E-05**	**91**	1.E-07	0.1	----	----	----	----
Central Plaza Park	2.E-12	0.0000005	**7.E-06**	**10**	----	----	----	----	8.E-12	0.00000007
Crane Cove Park	4.E-11	0.000005	**2.E-06**	**11**	----	----	----	----	2.E-10	0.0000006
Slipways Park	1.E-10	0.00001	**9.E-06**	**9.0**	----	----	----	----	4.E-10	0.000002
MGP Investigation Area	7.E-10	0.00005	1.E-06	**2**	1.E-06	0.004	----	----	3.E-09	0.000006

Notes:

MGP = Manufactured Gas Plant

HI = Hazard Index

---- = Not evaluated for specific receptor based on future land use of parcel.

a = Not evaluated because groundwater data was not available.

Bold entries identify cancer risk greater than one in a million or a hazard quotient or index greater than one.

Table 35
Comparison of Lead Exposure Point Concentrations to Soil Screening Levels
Pier 70 Master Plan Area
San Francisco, California

Parcel or Area	Future Land Use Evaluated	EPC (0-10 ft bgs)[a]	EPC (0-2 ft bgs)
		(mg/kg)	
1	Residential	420.9	191
2	Commercial	**1414**	2292
3	Residential	687.4	752.9
4	Commercial	116.8	128.3
5	Commercial	22.09	30.29
6	Commercial	512.8	109.5
7	Commercial	0.45	0.083
8	Commercial	0.36	----
9	Commercial	**1061**	2056
Central Plaza Park	Recreational	504.8	87
Crane Cove Park	Recreational	462.3	359.9
Slipways Park	Recreational	265	430
MGP Investigation Area	Commercial/Recreational	676.7	1110
Construction Worker Screening Level[b]		800	NA
Commercial Worker Screening Level[c]		NA	320
Residential Screening Level[c]		NA	80
Recreational Visitor Screening Level[d]		NA	80

Notes:

bgs = below ground surface
EPC = exposure point concentration
MGP = Manufactured Gas Plant
NA = Not applicable, lead soil data collected in the 0-10 feet depth interval compared to the screening level for the construction worker. Data collected in the 0-2 feet depth interval was used to evaluate the commercial worker, resident, and recreational visitor populations.
mg/kg = milligram per kilogram
---- = Soil data for 0-2 ft bgs depth interval not reported.
Bold entries identify concentrations in excess of the construction worker screening levels.

Shaded entries identify concentrations greater than future use screening level (i.e. residential, commercial, recreational).

[a] 0-10 ft bgs depth evaluated for construction worker scenario

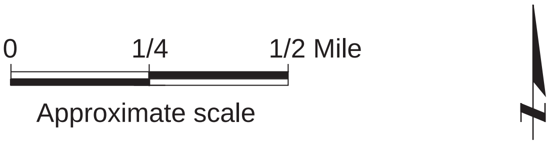
[b] United States Environmental Protection Agency (USEPA). 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites. May.

[c] California Environmental Protection Agency (Cal/EPA). 2009. Revised California Human Health Screening Levels for Lead. Office of Environmental Health Hazard Assessment (OEHHA). September.

[d] As a conservative screening approach, the revised CHHSL of for residential receptors was used for the evaluation of recreational users visiting Crane Cove, Central Plaza, and Slipways Parks.

FIGURES

Base map: The Thomas Guide
San Francisco County
1999



PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

Treadwell&Rollo

SITE LOCATION MAP

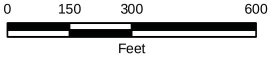
Date 09/27/10	Project No. 4963.01	Figure 1

Legend

- 🟦 Parcel Boundary
- 🟥 Pier 70 Site Area
- — Road Edge
- ▨ Building
- – – Approximate 1869 Shoreline

Notes:

1. Digital orthophotos from California Spatial Information Library (CASIL) UC Davis, *ca.* 2005, http://archive.casil.ucdavis.edu/casil/.
2. Site boundary, parcels, and acreages from ROMA Design Group, Draft Preferred Pier 70 Master Plan, 17 July 2009.
3. Approximate 1869 Shoreline based upon Board of Tidelands Commissioners, *Map of the Salt Marsh and Tide Lands and Lands Lying Under Water South of Second Street and Situate in the City and County of San Francisco*, 1869.
4. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.



PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

SITE PLAN

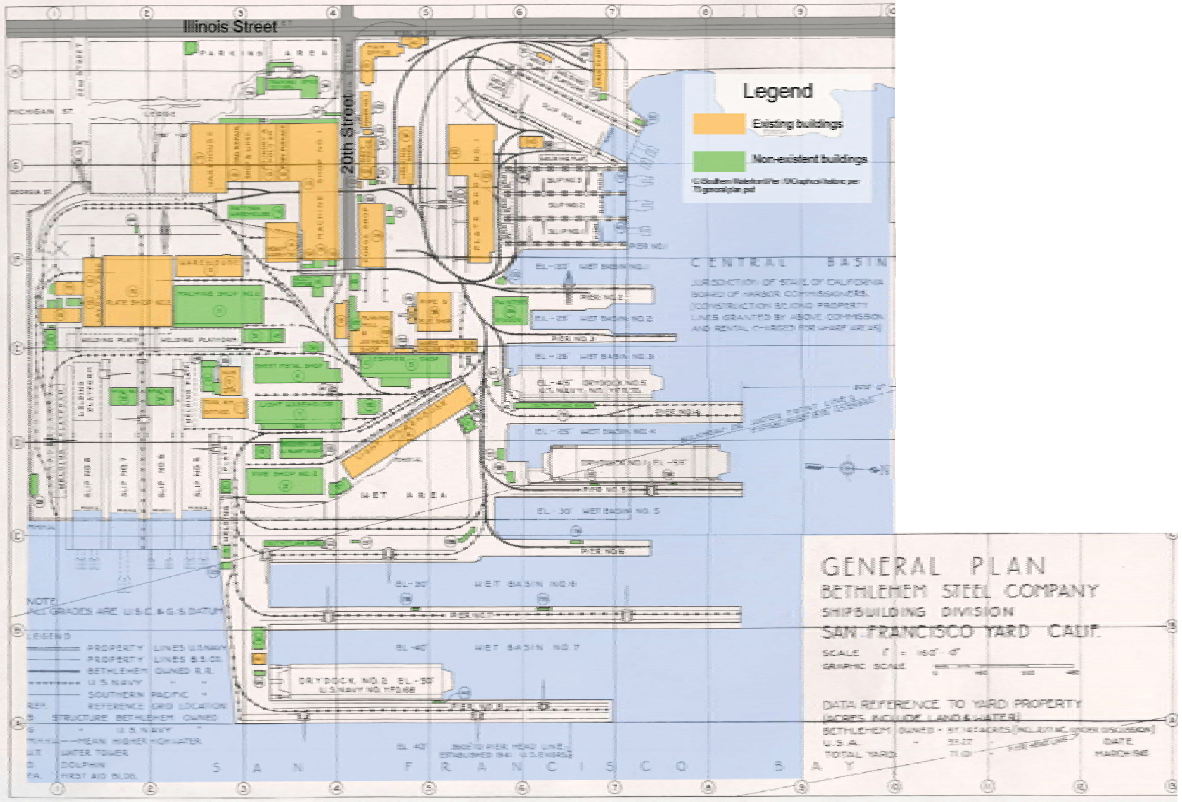
Date 9/14/2010	Project 4963.01	Figure 2

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2009\4963-01-001.mxd

Ownership Map of the Pier 70 Historic District. Boundaries shown above are approximate and are roughly based on the 1886, 1899, and 1914 Sanborn Maps.

- Union Iron Works Shipyard in 1884 Boundary estimated from 1886 Sanborn
- Pacific Rolling Mills (1868-1900) Boundary estimated from 1886 Sanborn
- Risdon Iron and Locomotive Works (1900-1911)
- Boundary of the WWI U. S. Destroyer Plant operated by Union Iron Works Company Owned by the U. S. Steel Products Company (U. S. Steel Corp. Subsidiary)



1945 Site Plan showing the yard's maximum build out at the end of World War II. The New Yard or Building 12 Complex is shown in the lower corner.

Reference:

http://www.sfgov.org/site/uploadedimages/port/about_us/divisions/planning_development/southern_waterfront/historic%20pier%2070%20general%20plan%20copy.jpg

http://www.sfgov.org/site/uploadedfiles/port/about_us/divisions/planning_development/southern_waterfront/pier_70_hist_ownership.pdf

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

HISTORIC SITE USES

Date 06/16/09	Project No. 4963.01	Figure 3

Treadwell&Rollo

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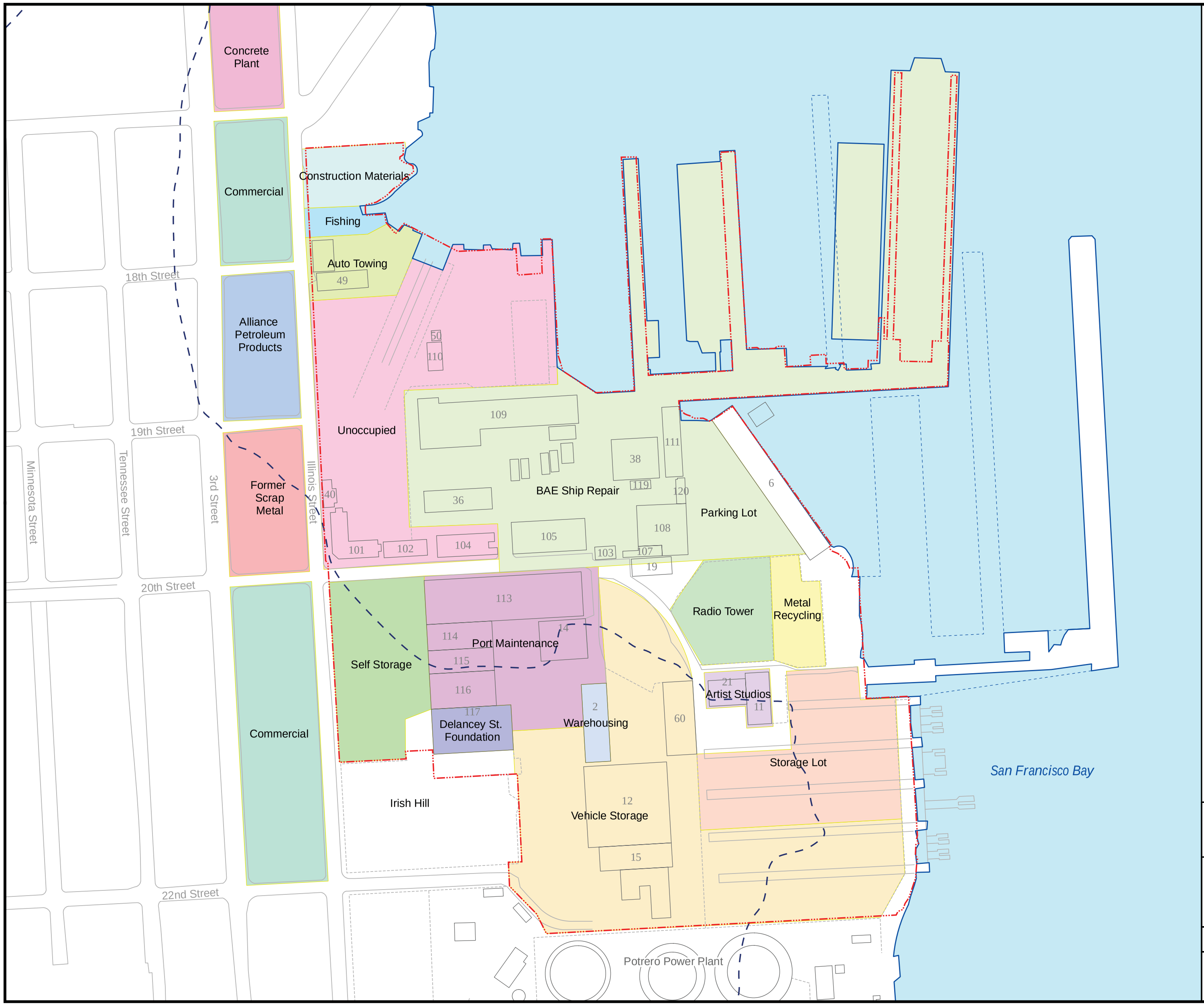

Legend

- Approximate 1869 Shoreline

Surface Feature

- Fence
- Other
- Road Edge
- Building
- Pier 70 Site Area

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
2. Current and recent historical shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/ website/sfshare/catalog/sfshoreext.zip.
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4. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

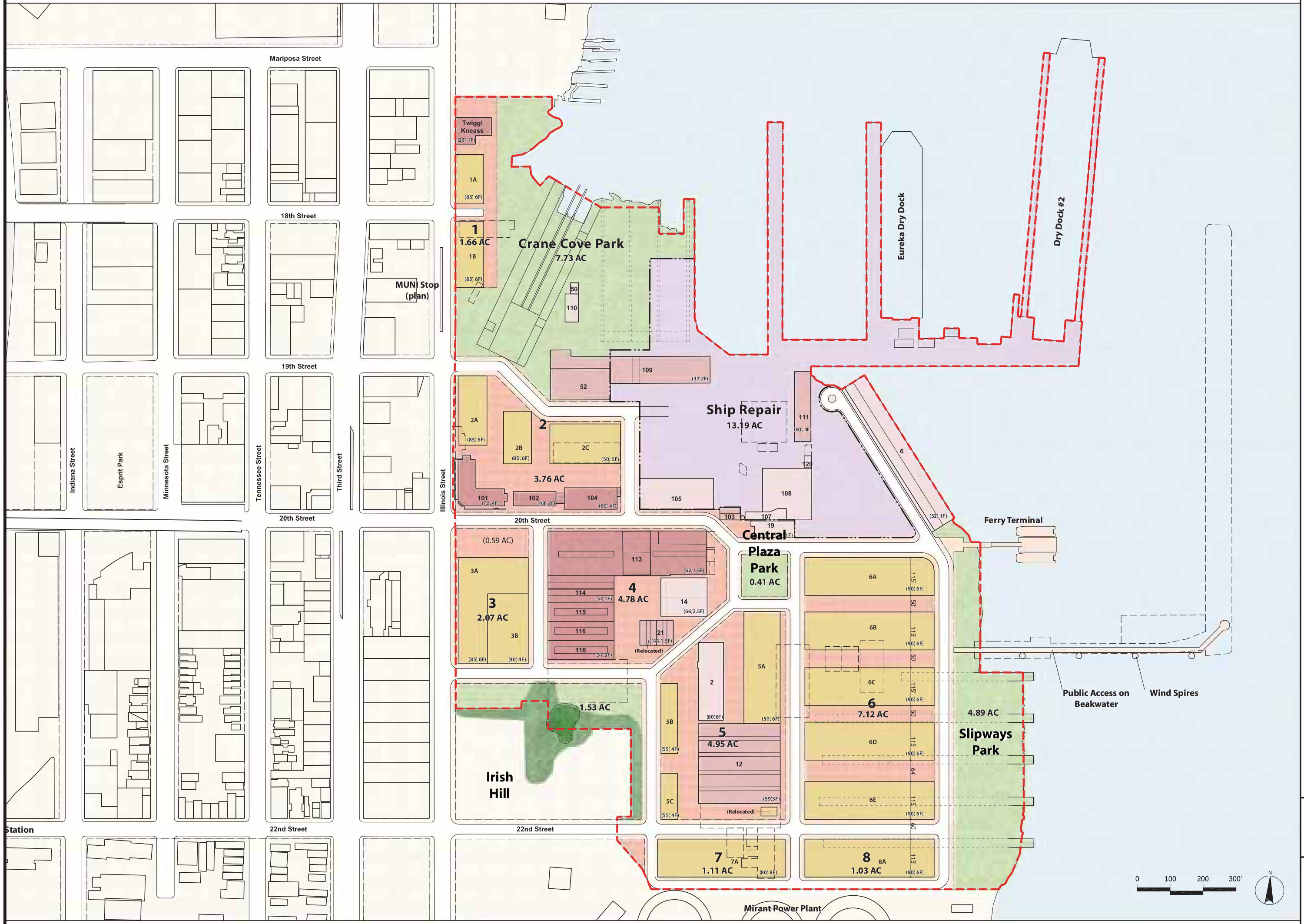
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

CURRENT LAND USE

Date 1/11/2011	Project 4963.01	Figure 4

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2009\4963-01-003.mxd



Legend

- ▨ Very Significant Resource
- ▨ Significant Resource
- ▨ Contributing Resource
- 🟩 Open Space
- ▨ Ship Repair
- ☐ Contributing Building Removed
- 🟨 New Building Pads

Pier 70 Total Site Area	65.32 AC
Ship Repair	13.19 AC
Historic Building Footprints*	6.34 AC (276,100 SF)
New Building Pads	12.11 AC (527,200 SF)
Streets	11.08 AC
Parks, Plazas and Pedestrian Ways	22.60 AC

* Not including inside Ship Repair and Crane Cove Park

Source:
ROMA Design Group and Associated Consultants,
Pier 70 Draft Preferred Master Plan, 17 July 2009.

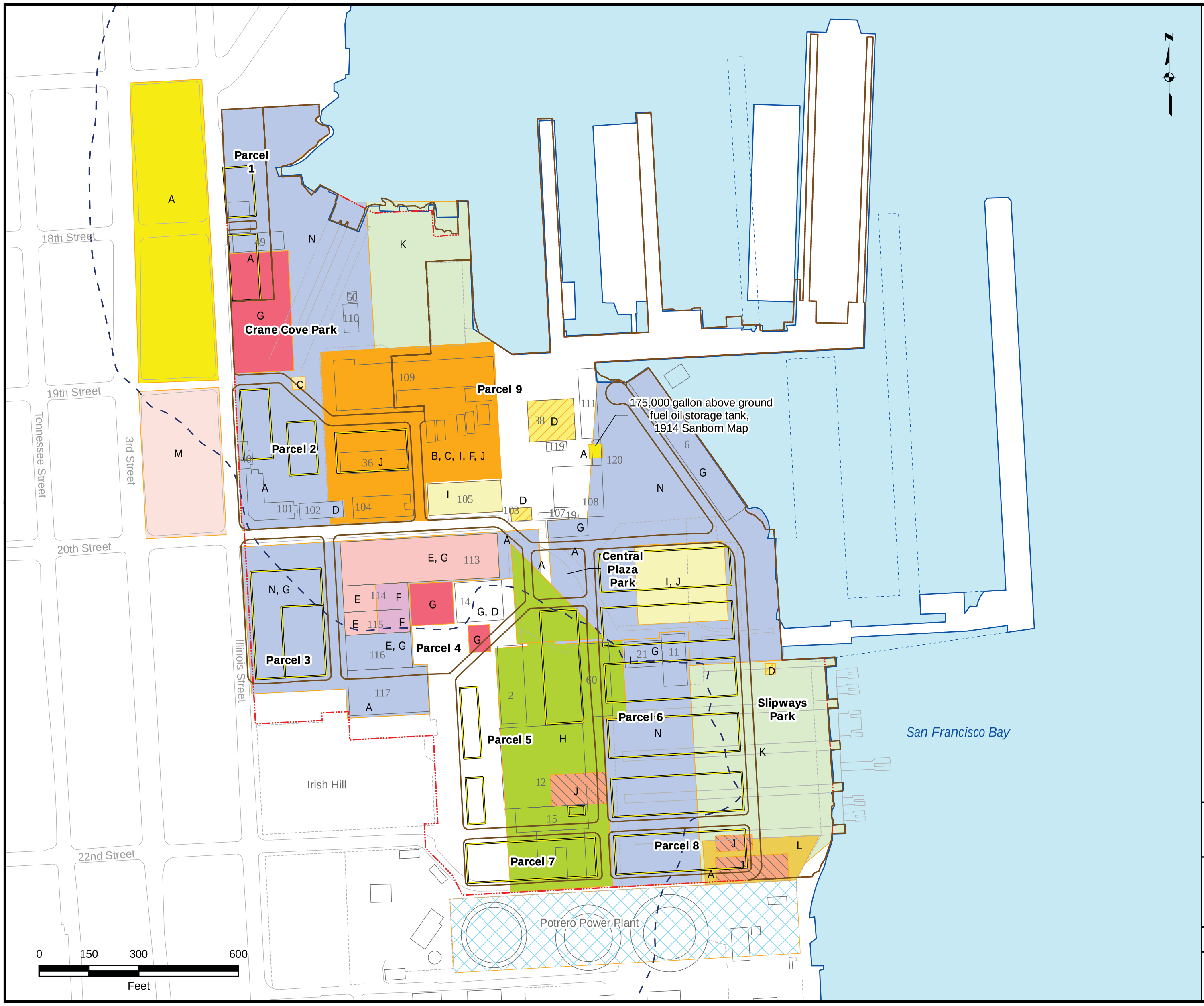
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, Califorina

MASTER PLAN

Date 5/27/2010	Project 4963.01	Figure 5

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2009\4963-01-005.ai



Legend

Surface Feature

- Fence
- Other
- Road Edge
- Approximate 1869 Shoreline
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)

Potential Source Area

- A, UST/AST Fuel Storage
- B, Paint Shop
- C, Galvanizing
- D, Powerhouse (Boiler/Transformer)
- E, Machine Shop
- F, Foundry
- G, Hazardous Waste Storage
- H, Machine Shop/Auto Wrecking
- I, Metal Fabrication/Substation
- J, Plating/Welding
- K, Filled Slipways
- L, Historical Manufactured Gas Plant Investigation Area
- M, Metals Recycling
- N, Bay Fill with PAHs, Metals, and Asbestos
- O, Power Plant
- Multiple Source Areas. See Descriptions Above.

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
2. Current and recent historical shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/ website/sfshare/catalog/sfshoreext.zip.
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5. Site boundary and parcels from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
6. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

POTENTIAL SOURCE AREAS

Date 1/10/2011 | Project 4963.01 | Figure 6

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2009\4963-01-002.mxd

Legend

Sample Location and Matrix

- ■ Sediment
- ◆ Soil
- ▨ Soil and Groundwater
- ▼ Soil and Leachate from Soil
- ⊕ Groundwater
- × Leachate from Soil
- ● Surface Water

Shoreline

- — Existing
- - - Historical

Surface Feature

- - - Fence
- — Other
- — Road Edge
- ▨ Building

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
2. Current and recent historical shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/ website/sfshare/catalog/sfshoreext.zip
3. Approximate 1869 Shoreline based upon Board of Tidelands Commissioners, *Map of the Salt Marsh and Tide Lands and Lands Lying Under Water South of Second Street and Situate in the City and County of San Francisco*, 1869.
4. In cases where historical samples from different periods had identical names, an abbreviation of the firm's name that performed the work was added as a suffix to the location name. In cases where the same firm produced samples with duplicate names, the year the work was performed was also added as a suffix.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

0 150 300 600
Feet

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

PREVIOUS INVESTIGATION SAMPLING LOCATIONS

Date 1/10/2011	Project 4963.01	Figure 7

Treadwell&Rollo

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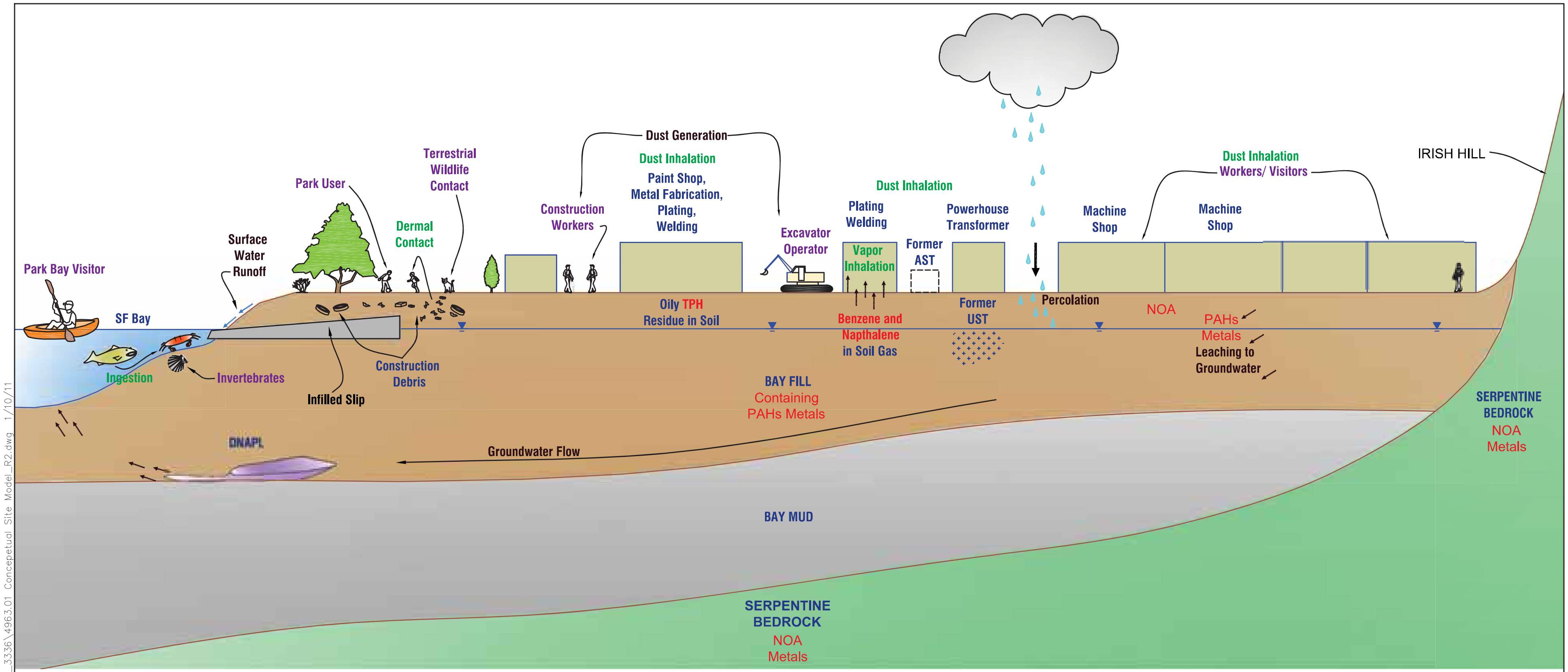


EXPLANATION

COPCs:	Contaminants of potential concern
NOA	Naturally occurring asbestos
PAHs	Polycyclic aromatic hydrocarbons
VOCs	Volatile organic compounds
PCBs	Polychlorinated biphenyls
TPH	Total petroleum hydrocarbons
⁘	Heavily degraded highly viscous petroleum hydrocarbons
▬	Dense non-aqueous phase liquid (DNAPL)

↑ ↑ ↑	Soil vapor
B36	Building number
▼	Water table
←	Groundwater flow
▭	Building

Receptors

Source

Exposure Pathway

Exposure Media and Release Mechanism

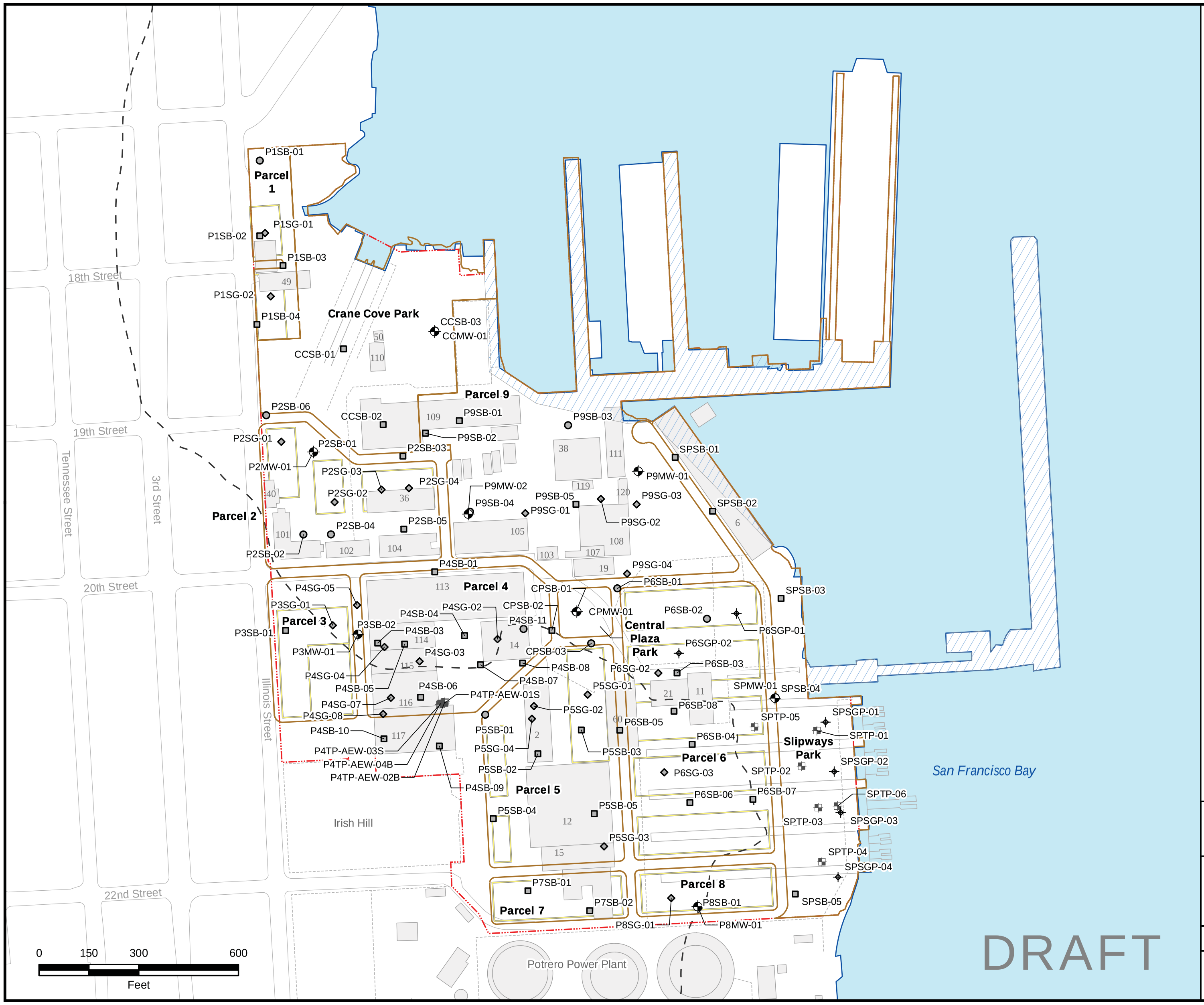
NOT TO SCALE

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

UPDATED SITE CONCEPTUAL MODEL

Date 10/05/10	Project No. 4963.01	Figure 8

Treadwell&Rollo



Legend

Sample Location
- Monitoring Well
- Soil
- Soil Gas
- Soil and/or Grab Groundwater
- Soil Gas Probe
- Test Pit

Surface Feature
- Fence
- Other
- Road Edge
- Approximate 1869 Shoreline
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
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4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

PHASE 1 SAMPLING LOCATIONS

Date 9/30/2010	Project 4963.01	Figure 9

Treadwell&Rollo

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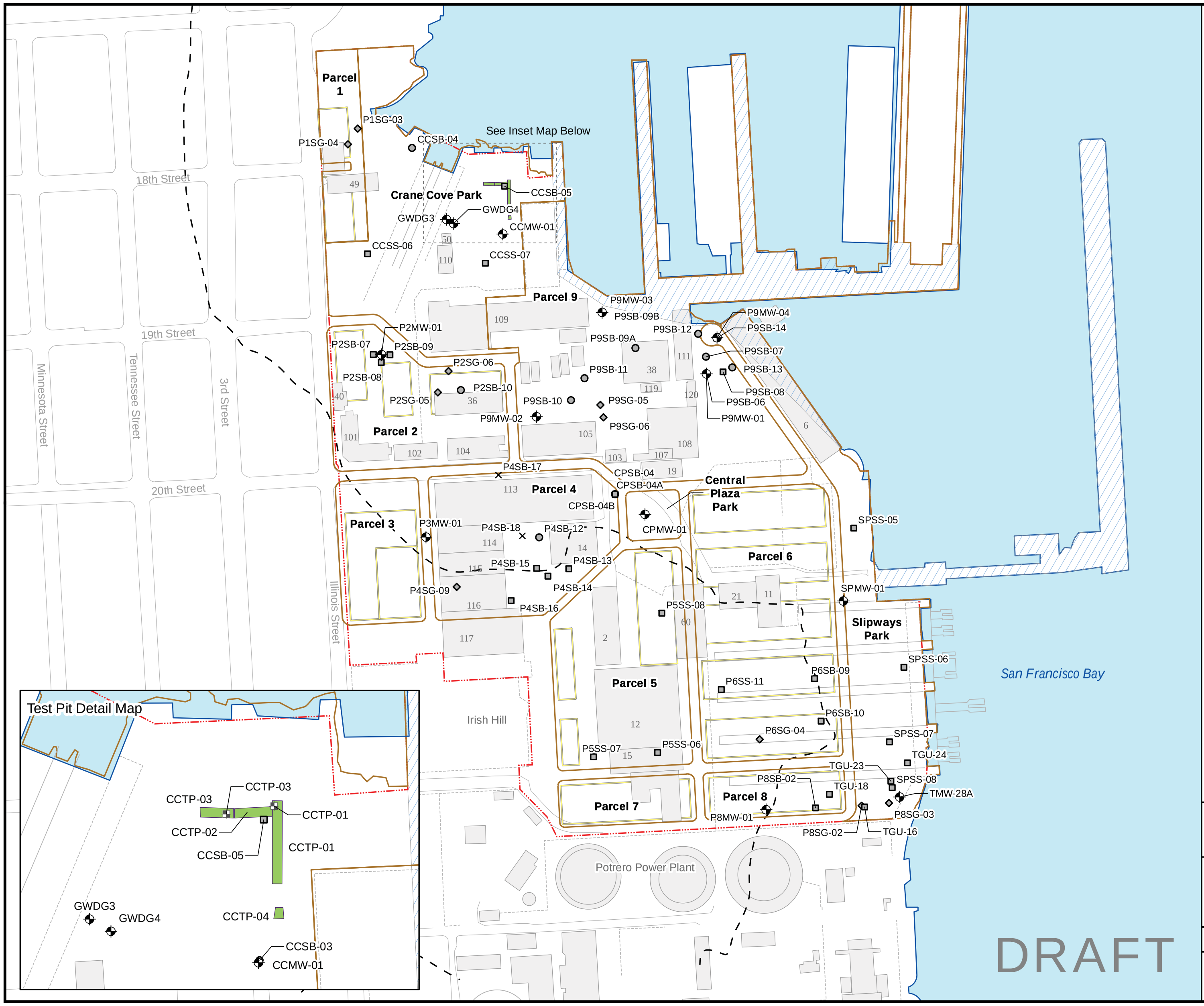

N

Legend

Sample Location
- ◆ Monitoring Well
- ■ Soil
- ◇ Soil Gas
- ● Soil and or Groundwater
- × Geotechnical Boring

Surface Feature
- ┄ Fence
- ─ Other
- – – Approximate 1869 Shoreline
- ─ Road Edge
- ▭ Building
- ▭ Proposed Building
- ▭ Pier 70 Site Area
- ▭ Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water
- 🟩 Test Pit Extent

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
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5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

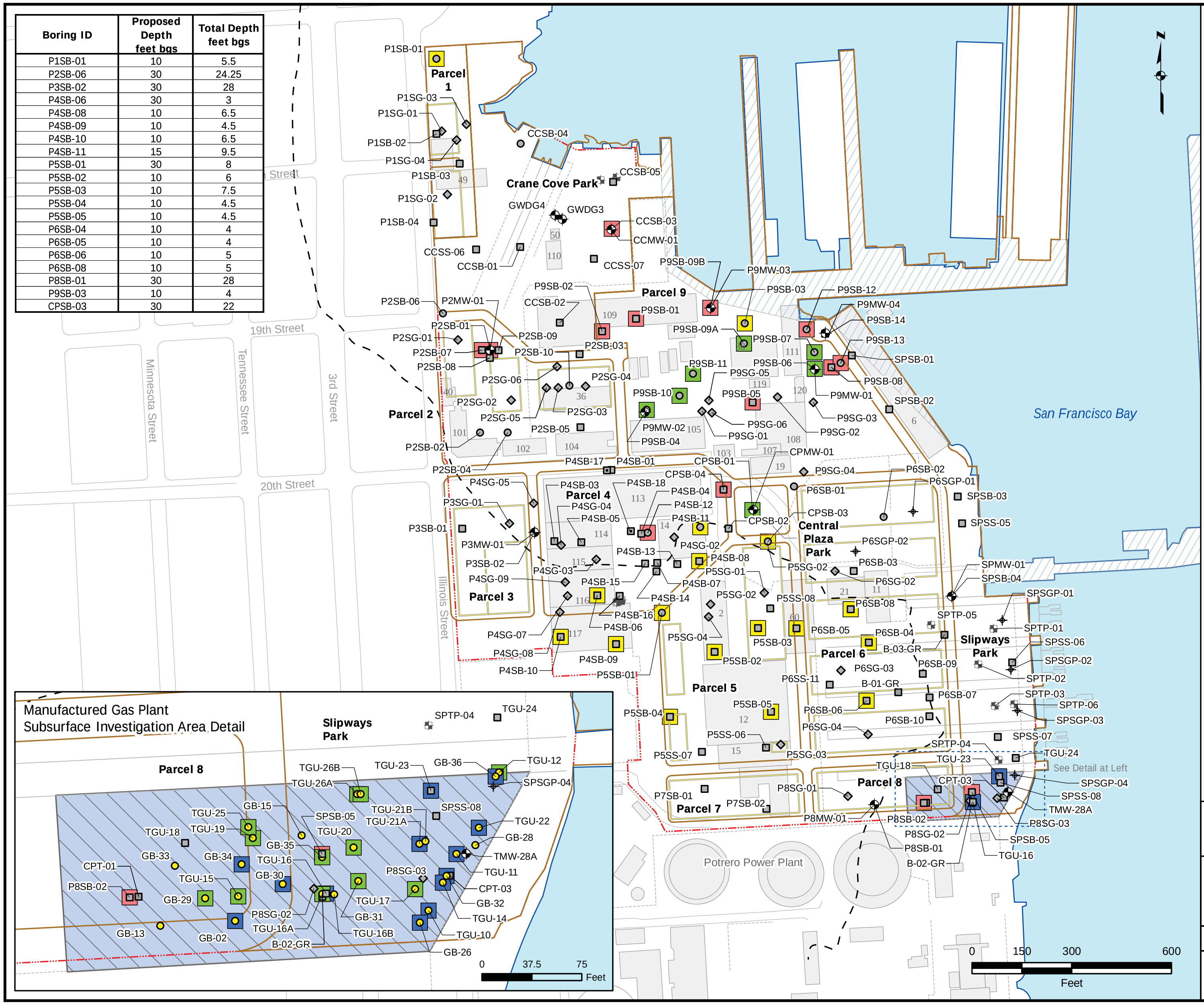
PHASE 2 SAMPLING LOCATIONS

Date 10/5/2010	Project 4963.01	Figure 10

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-049.mxd

Boring ID	Proposed Depth feet bgs	Total Depth feet bgs
P1SB-01	10	5.5
P2SB-06	30	24.25
P3SB-02	30	28
P4SB-06	30	3
P4SB-08	10	6.5
P4SB-09	10	4.5
P4SB-10	10	6.5
P4SB-11	15	9.5
P5SB-01	30	8
P5SB-02	10	6
P5SB-03	10	7.5
P5SB-04	10	4.5
P5SB-05	10	4.5
P6SB-04	10	4
P6SB-05	10	4
P6SB-06	10	5
P6SB-08	10	5
P8SB-01	30	28
P9SB-03	10	4
CPSB-03	30	22



Legend

Sample Location
- ◆ Monitoring Well
- ▣ Geotechnical Boring
- ■ Soil
- ○ Soil and or Groundwater
- ◇ Soil Gas
- ✦ Soil Gas Probe
- ▨ Test Pit

Boring Completion Summary
- 🟨 Early Refusal
- 🟥 Oily Residue Observed in Soil
- 🟩 Non-Aqueous Phase Liquid Present
- 🟦 Dense Non-Aqueous Phase Liquid Present
- — — Approximate 1869 Shoreline

Surface Feature
- Fence
- Other
- Road Edge
- ▨ Historical Manufactured Gas Plant Subsurface Investigation Area
- ☐ Building
- ☐ Proposed Building
- ☐ Pier 70 Site Area
- ☐ Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water
- ● Soil Borings from Amec, 2009 and 2010

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
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5. Historical Manufactured Gas Plant Subsurface Investigation Area and additional sample points taken from AMEC Geomatrix , *Report of Results: Subsurface Investigation Activities Evaluation of Impact to Fill and Bay Mud, Potrero Power Plant*, Figures 2 and 19, September 2010.
6. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

BORING COMPLETION SUMMARY

Date 10/12/2010	Project 4963.01	Figure 11

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-062.mxd

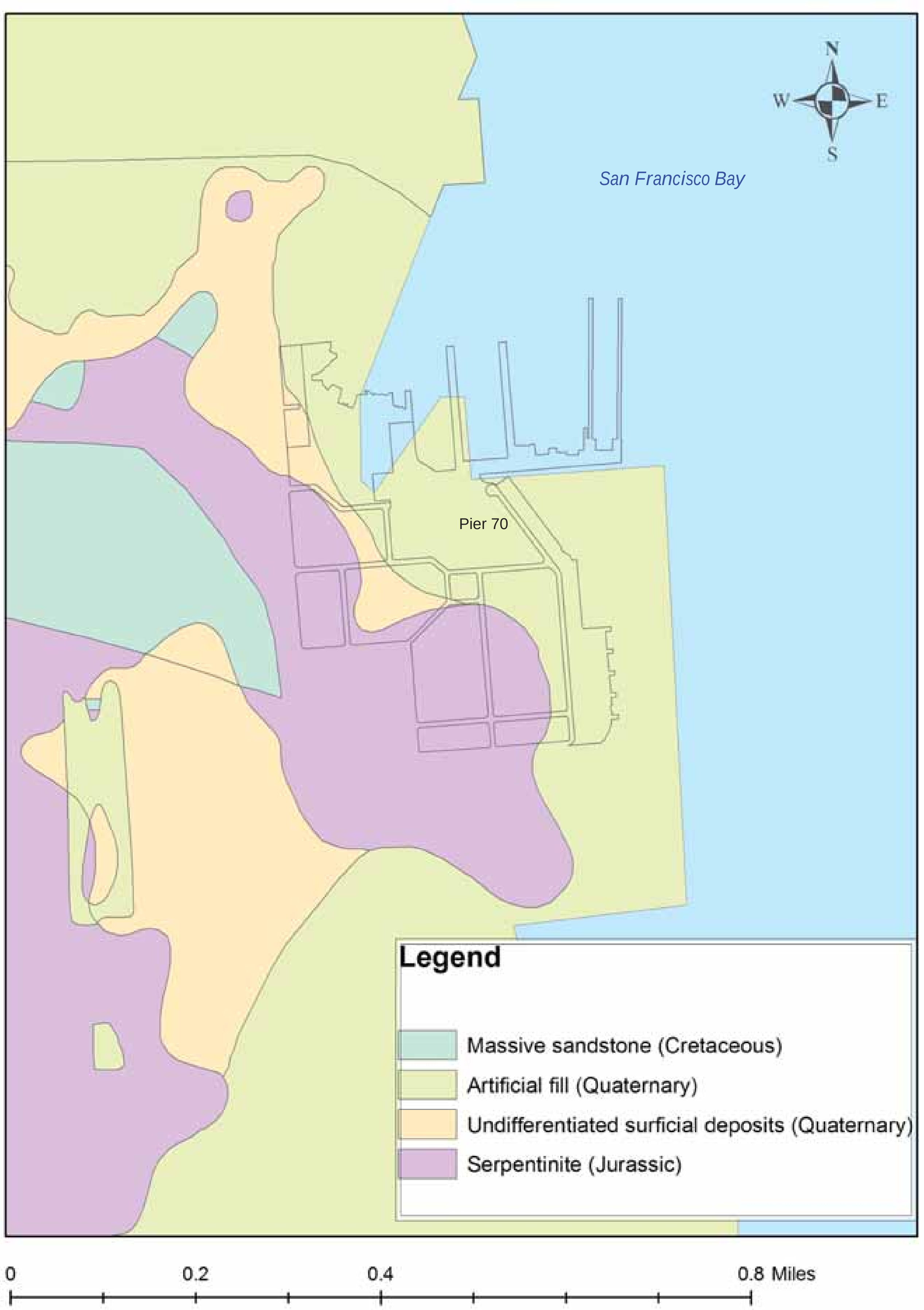
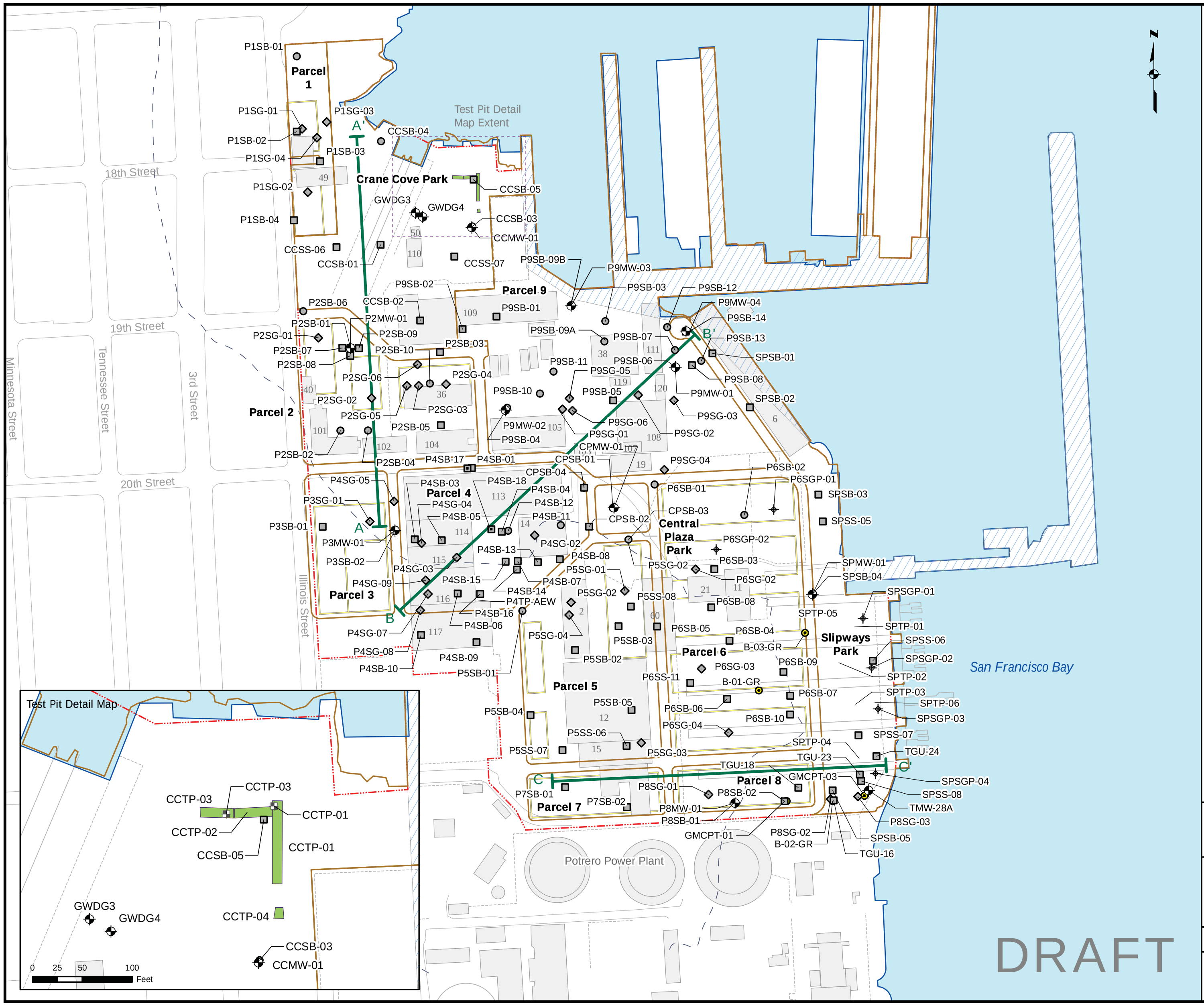


Figure 12 Geologic Map of Pier 70 Vicinity



Legend

Sample Location

- ⊕ Monitoring Well
- ◘ Geotechnical Boring
- ■ Soil
- ● Soil and or Groundwater
- ◆ Soil Gas
- ✦ Soil Gas Probe
- ⊙ Historical Boring Used for Subsurface Profile
- ━ Subsurface Profile
- – – Approximate 1869 Shoreline

Surface Feature

- ┈ Fence
- ─ Other
- ─ Road Edge
- ▭ Building
- ▭ Proposed Building
- ▭ Pier 70 Site Area
- ▭ Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water
- 🟩 Test Pit Extent

0 150 300 600
Feet

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
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5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

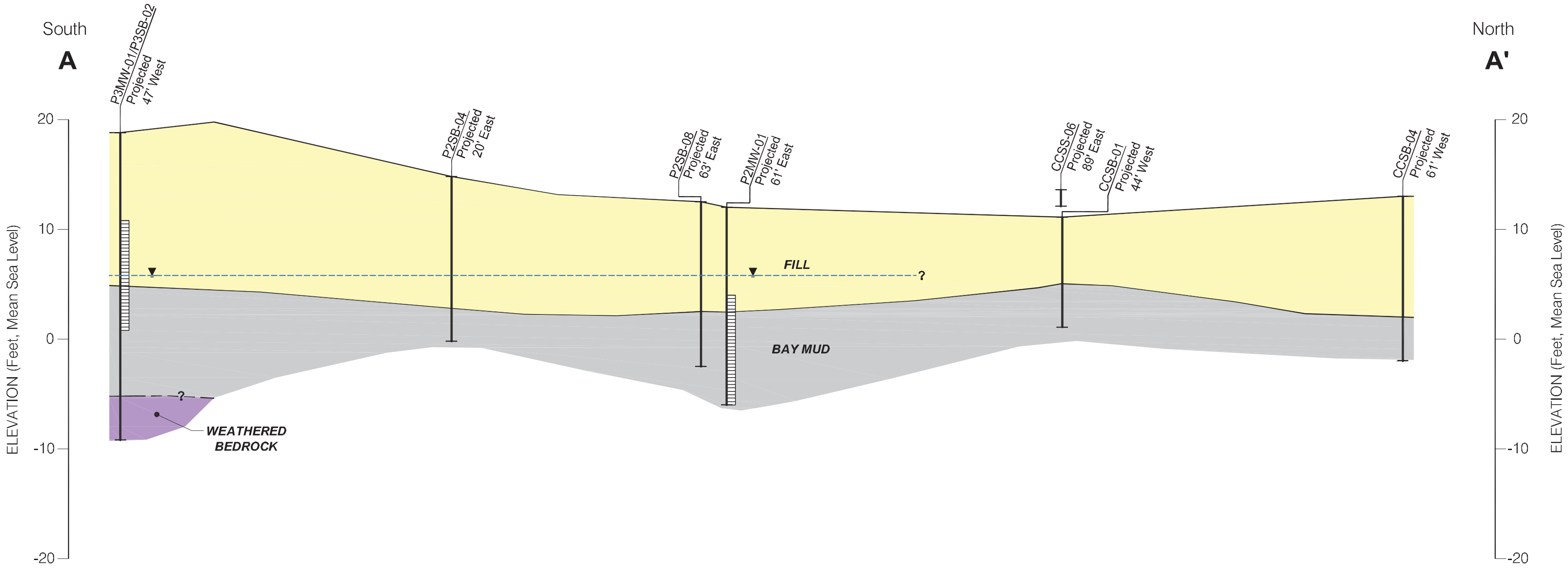
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

IDEALIZED SUBSURFACE PROFILE LOCATIONS

Date 9/29/2010 | Project 4963.01 | Figure 13

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-045.mxd



EXPLANATION

🟨 Fill

▨ Bay Mud

🟪 Weathered Bedrock

— — Geologic contact, dashed where inferred

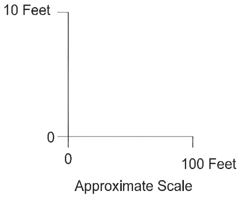
I Soil Boring

▤ Well Screen

- - - Groundwater level (March 2010)

▼ Stabilized groundwater level (March 2010)

Notes:
1. The above profile represents a generalized soil cross section interpreted from widely spaced borings. Soil deposits may vary in type, strength, and other important properties between points of exploration.



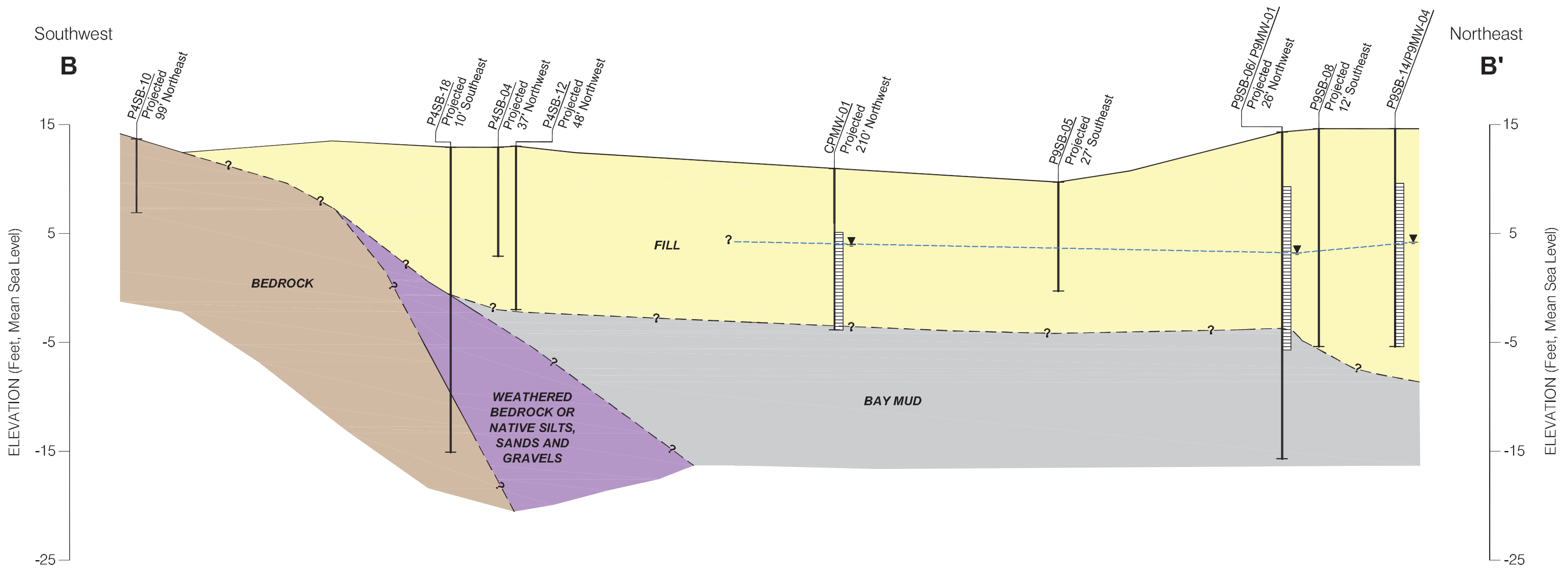
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

IDEALIZED SUBSURFACE PROFILE A-A'

Date 03/25/10	Project No. 4963.01	Figure 14

Treadwell&Rollo

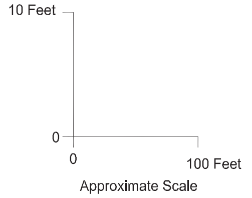
R:\Trgraphics\4900's\4963.01\4963.01 Idealized Subsurface Profiles A-A to C-C.dwg 7/26/10



EXPLANATION

- 🟨 Fill
- ⬜ Bay Mud
- 🟪 Weathered Bedrock or Native Silts, Sands and Gravels
- 🟫 Bedrock (Franciscan Complex; Sandstone Shale and Serpentinite)
- — — Geologic contact, dashed where inferred
- I Soil Boring
- ▤ Well Screen
- - - - Groundwater level (March 2010)
- ▼ Stabilized groundwater level (March 2010)

Notes:
1. The above profile represents a generalized soil cross section interpreted from widely spaced borings. Soil deposits may vary in type, strength, and other important properties between points of exploration.



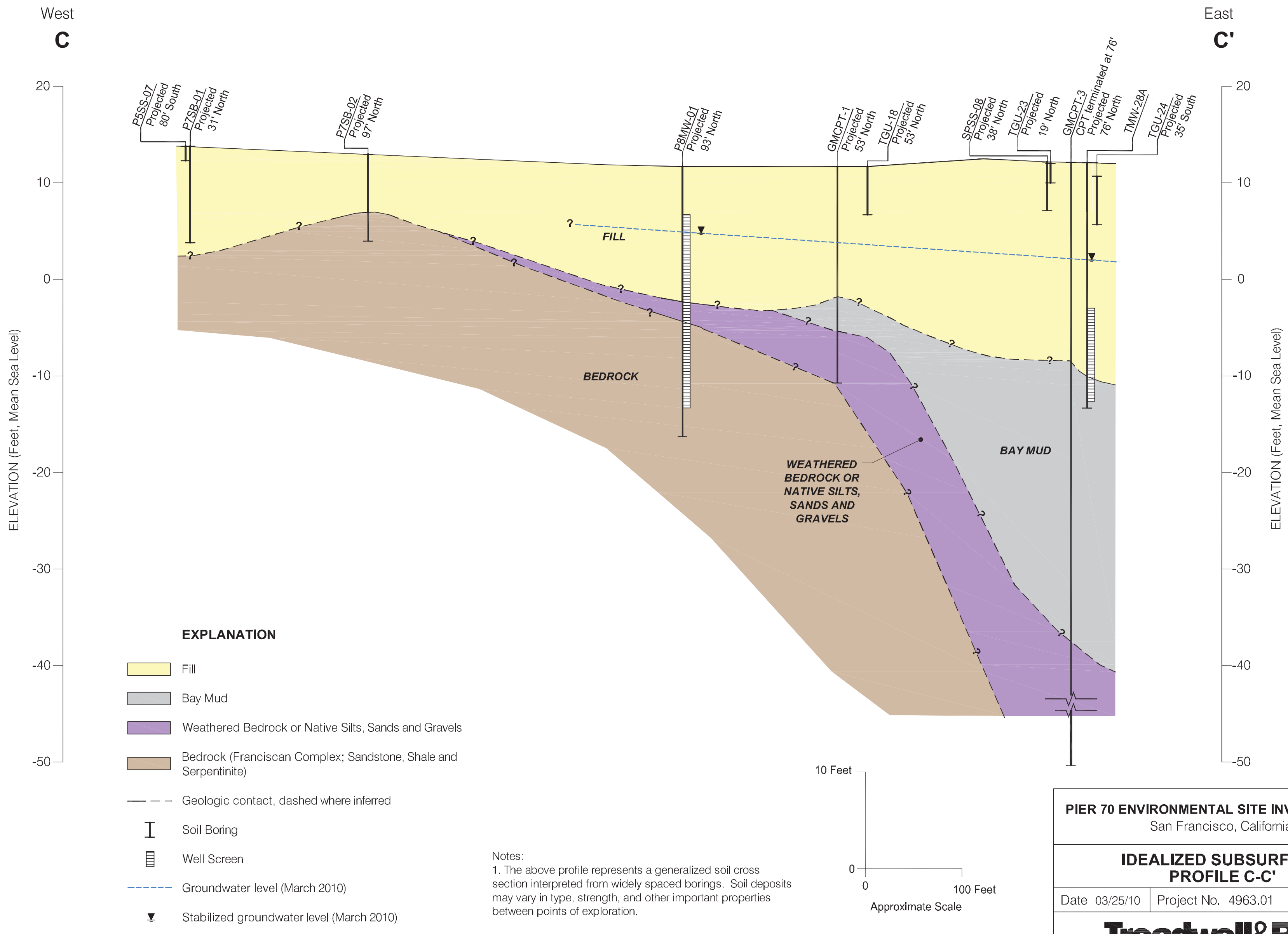
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

IDEALIZED SUBSURFACE PROFILE B-B'

Date 03/25/10	Project No. 4963.01	Figure 15

Treadwell&Rollo

R:\Trgraphics\4900's\4963.01\4963.01 Idealized Subsurface Profiles A-A to C-C.dwg 7/26/10



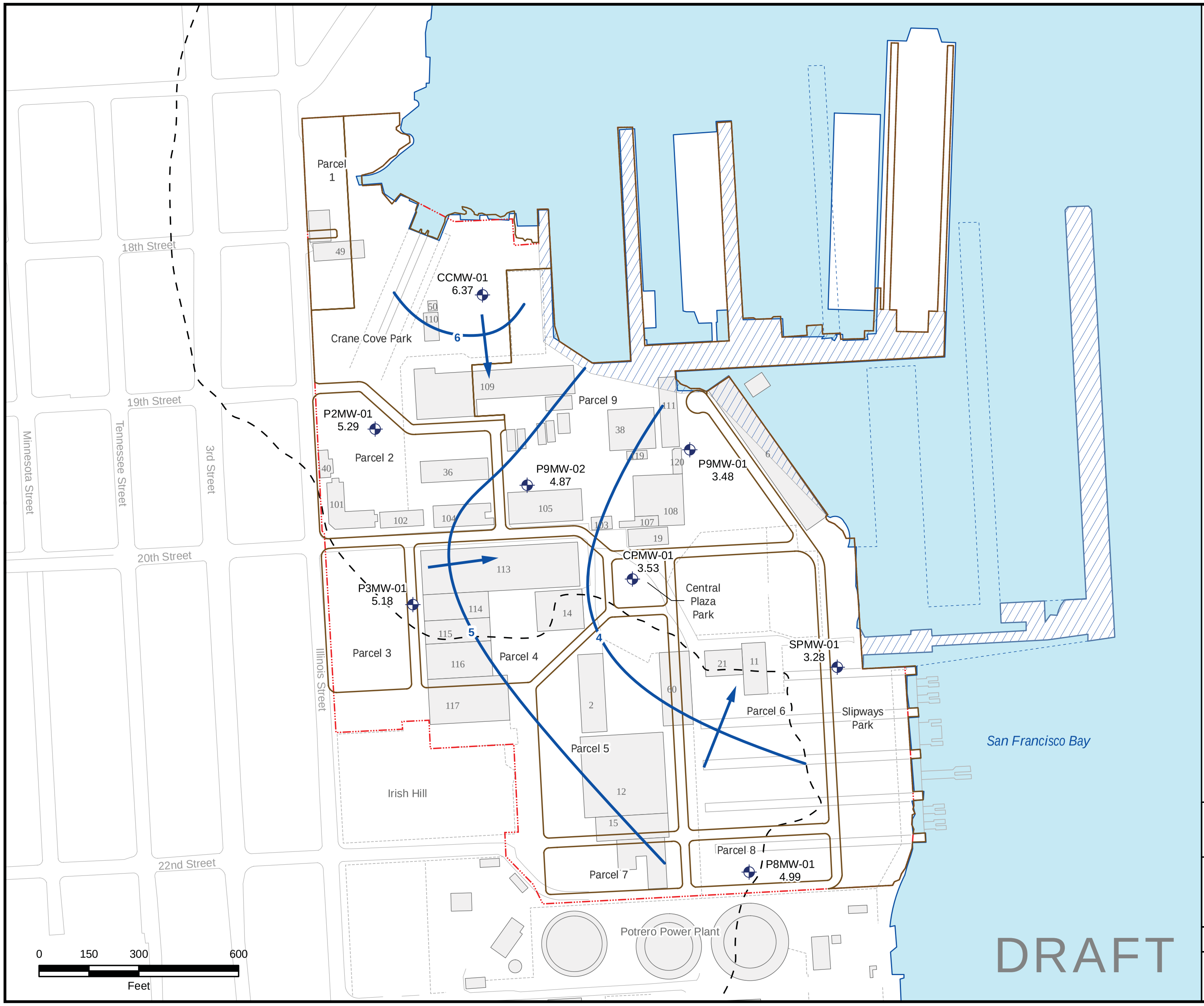
Notes:
1. The above profile represents a generalized soil cross section interpreted from widely spaced borings. Soil deposits may vary in type, strength, and other important properties between points of exploration.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

IDEALIZED SUBSURFACE PROFILE C-C'

Date 03/25/10	Project No. 4963.01	Figure 16

Treadwell&Rollo



Legend

3.48 ⌖	Monitoring Well Location and Groundwater Elevation Measurement
━	Groundwater Elevation Contour
➔	Approximate Groundwater Flow Direction
– –	Approximate 1869 Shoreline

Surface Feature

┄	Fence
─	Other
─	Road Edge
▭	Building
▭	Pier 70 Site Area
▭	Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
▨	Pile-Supported Structure Over Water

Notes:

1. Groundwater elevations measured on 6 October 2009.
2. Groundwater elevation values and contours expressed in US Survey Feet above mean sea level, referenced to the North American Vertical Datum of 1988 (NAVD88).
3. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
4. Shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/website/sfshare/catalog/sfshoreext.zip.
5. Approximate 1869 Shoreline based upon Board of Tidelands Commissioners, *Map of the Salt Marsh and Tide Lands and Lands Lying Under Water South of Second Street and Situate in the City and County of San Francisco*, 1869.
6. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
7. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

PHASE I
GROUNDWATER ELEVATION MAP

Date 9/15/2010	Project 4963.01	Figure 17

Treadwell&Rollo

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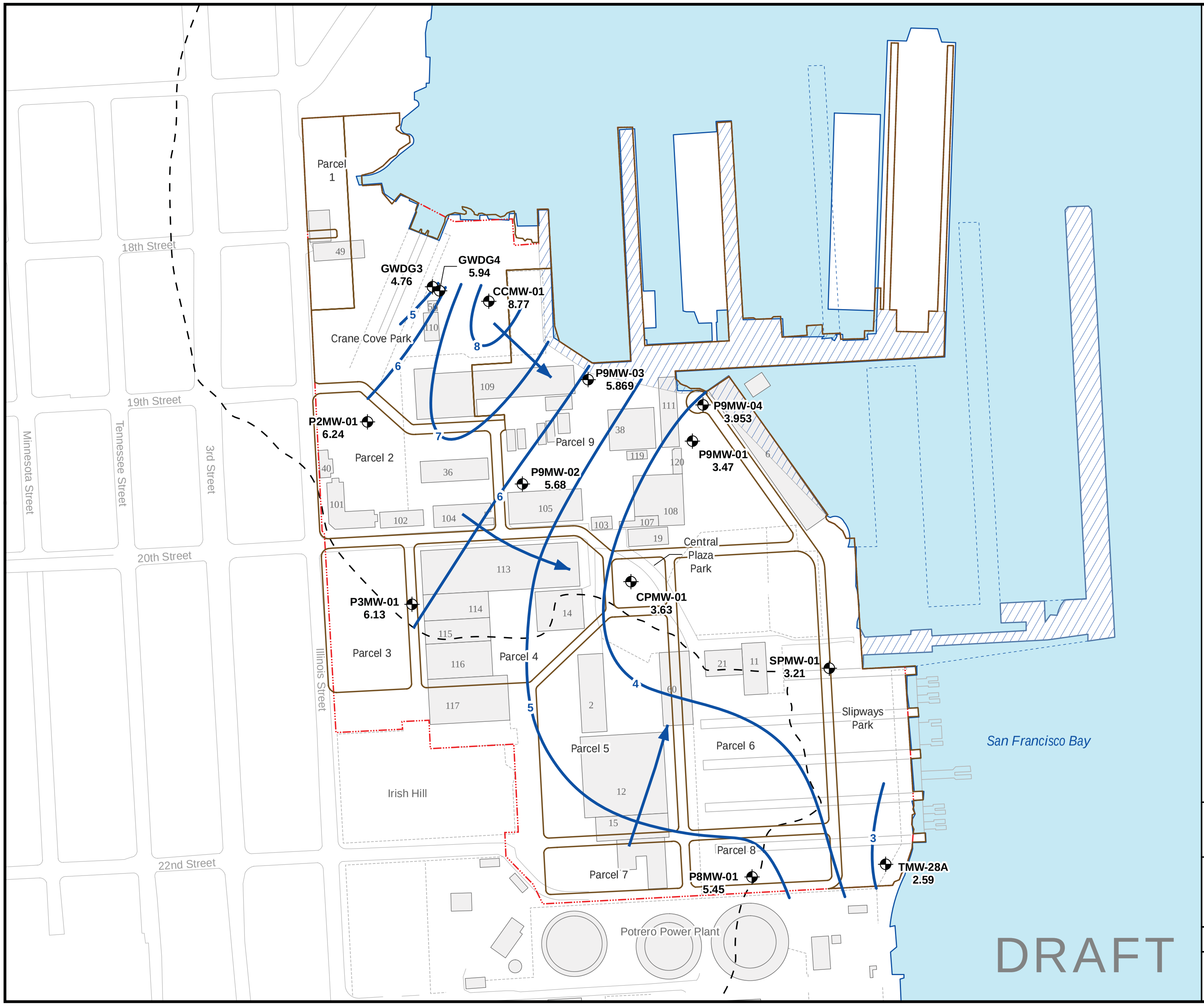

Legend

- 3.47 ⊕ Monitoring Well
- Groundwater Elevation Contour
- Approximate Groundwater Flow Direction
- Approximate 1869 Shoreline
- Surface Feature
  - Fence
  - Other
  - Road Edge
  - Building
  - Pier 70 Site Area
  - Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
  - Pile-Supported Structure Over Water

Notes:

1. Groundwater elevations measured on 19 March 2010.
2. Groundwater elevation values and contours expressed in US Survey Feet above mean sea level, referenced to the North American Vertical Datum of 1988 (NAVD88).
3. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
4. Shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/website/sfshare/catalog/sfshoreext.zip.
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6. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
7. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

0 150 300 600
Feet

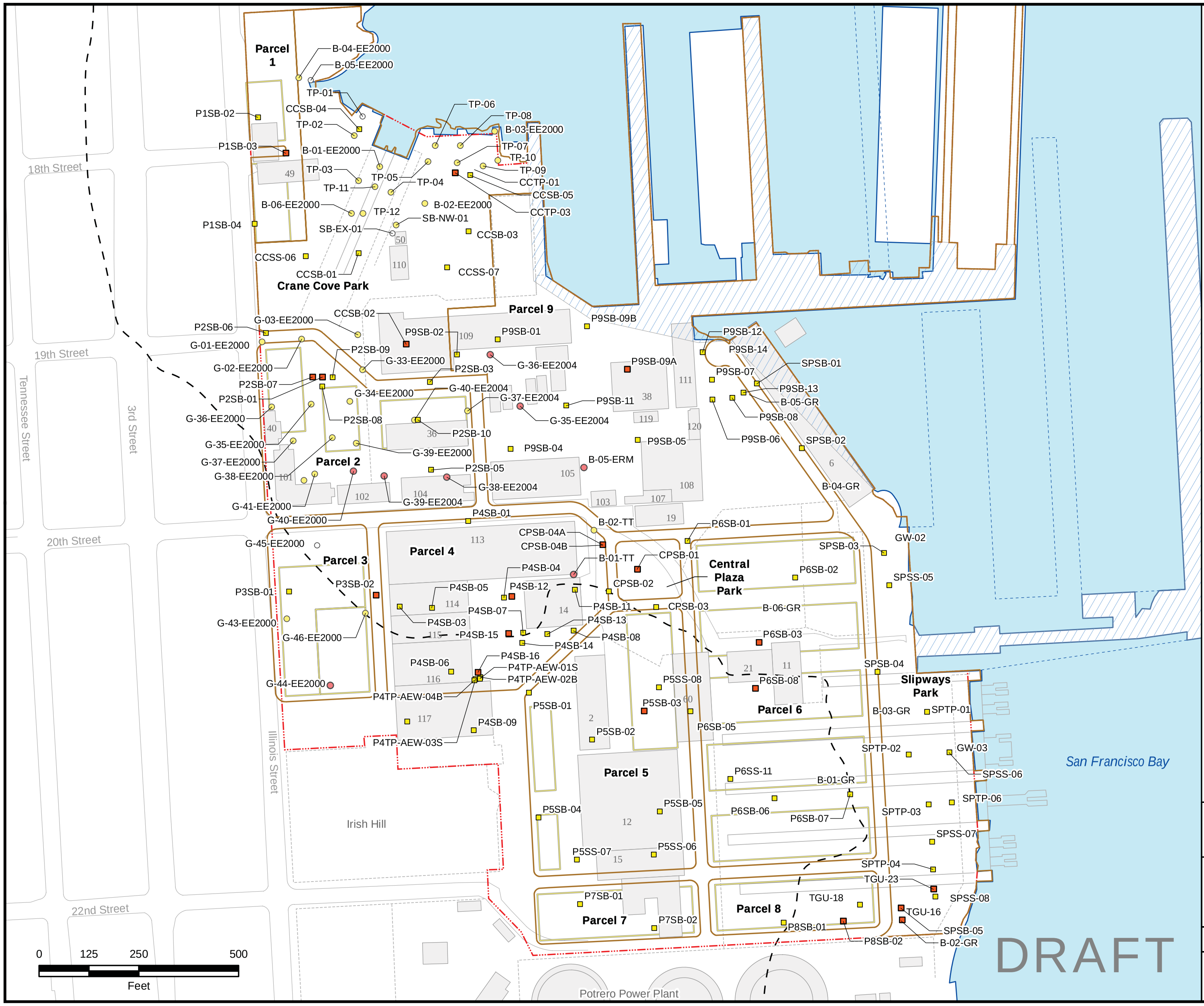
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

PHASE 2
GROUNDWATER ELEVATION MAP

Date 10/5/2010	Project 4963.01	Figure 18

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-061.mxd



Legend

Historical Sample Location
- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location
- ■ Detected Below ESL
- 🟥 Exceedance of ESL

Surface Feature
- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
2. Current and recent historical shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/ website/sfshare/catalog/sfshoreext.zip.
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4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

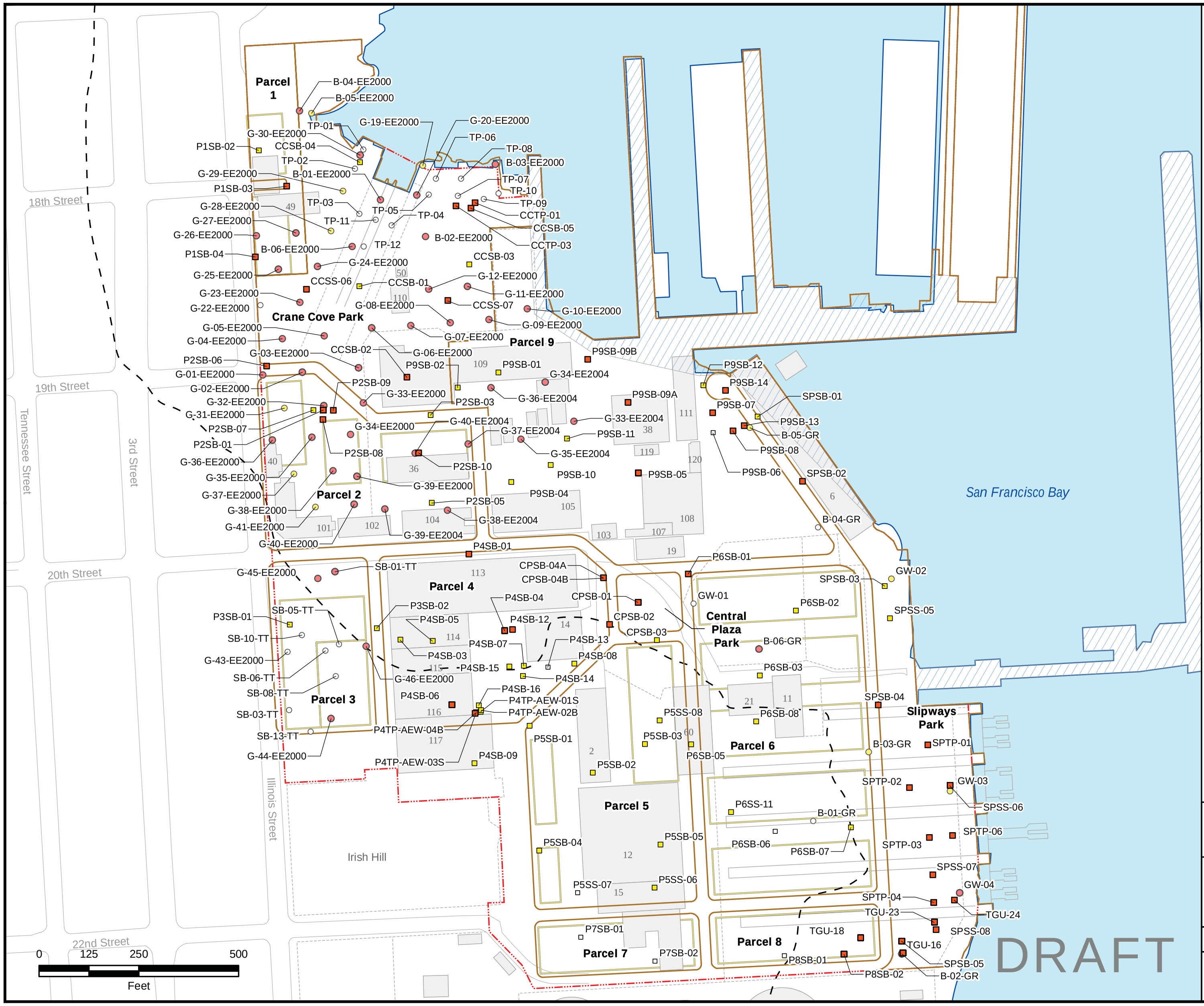
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

TPH RESULTS AND ESL EXCEEDANCES IN SHALLOW SOIL (0-10 FEET)

Date 9/15/2010	Project 4963.01	Figure 19

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-050.mxd



Legend

Historical Sample Location
- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location
- □ Not Detected
- ■ Detected Below ESL
- ■ Exceedance of ESL

Surface Feature
- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- ▨ Building
- ☐ Proposed Building
- ☐ Pier 70 Site Area
- ☐ Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
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4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

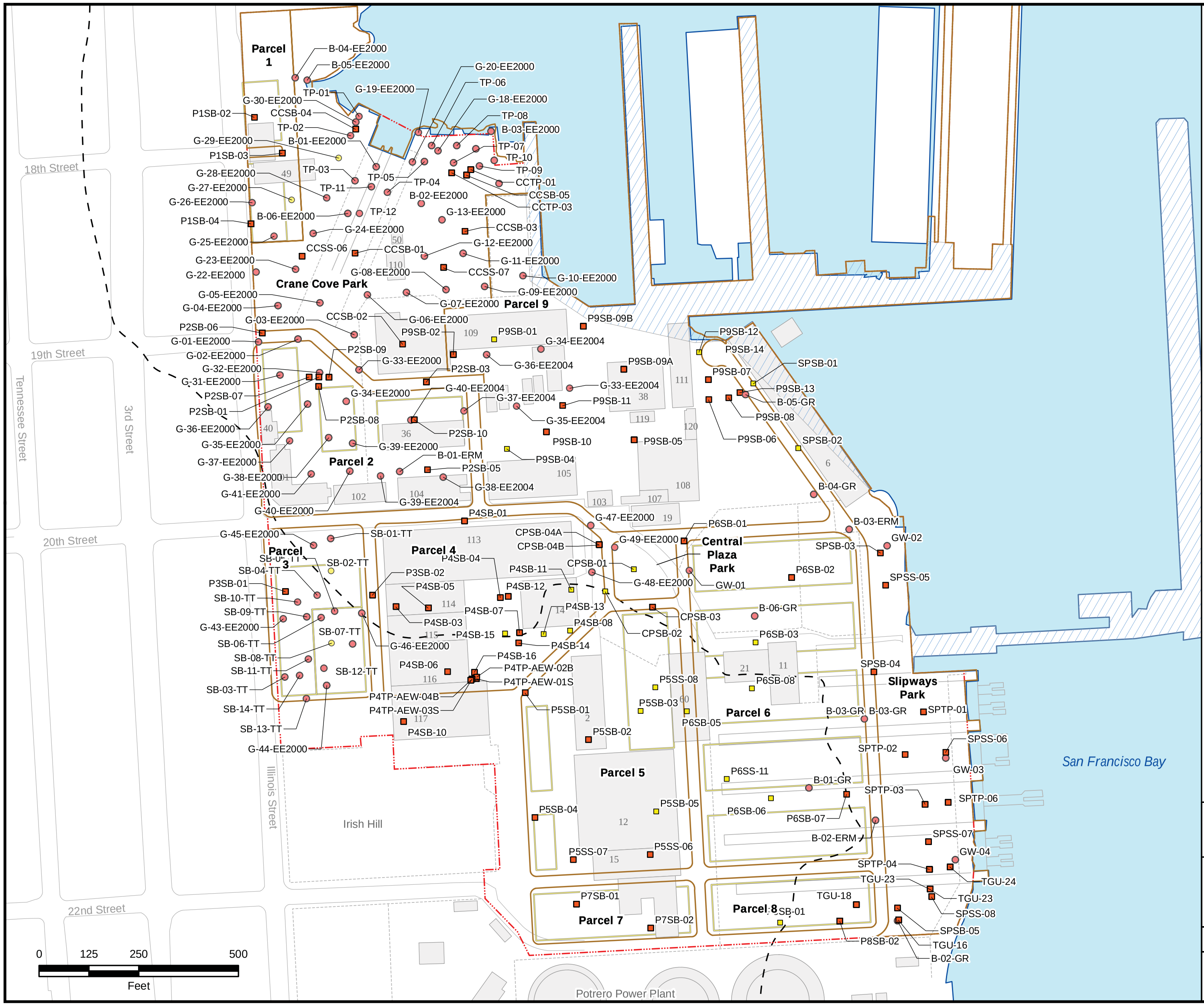
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

PAH RESULTS AND ESL EXCEEDANCES IN SHALLOW SOIL (0-10 FEET)

Date 9/15/2010	Project 4963.01	Figure 20

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-051.mxd



Legend

Historical Sample Location
- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location
- □ Not Detected
- ■ Detected Below ESL
- ■ Exceedance of ESL

Surface Feature
- ---- Fence
- —— Other
- — — Approximate 1869 Shoreline
- —— Road Edge
- ▭ Building
- ▭ Proposed Building
- ▭ Pier 70 Site Area
- ▭ Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
2. Current and recent historical shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/ website/sfshare/catalog/sfshoreext.zip.
3. Approximate 1869 Shoreline based upon Board of Tidelands Commissioners, *Map of the Salt Marsh and Tide Lands and Lands Lying Under Water South of Second Street and Situate in the City and County of San Francisco*, 1869.
4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

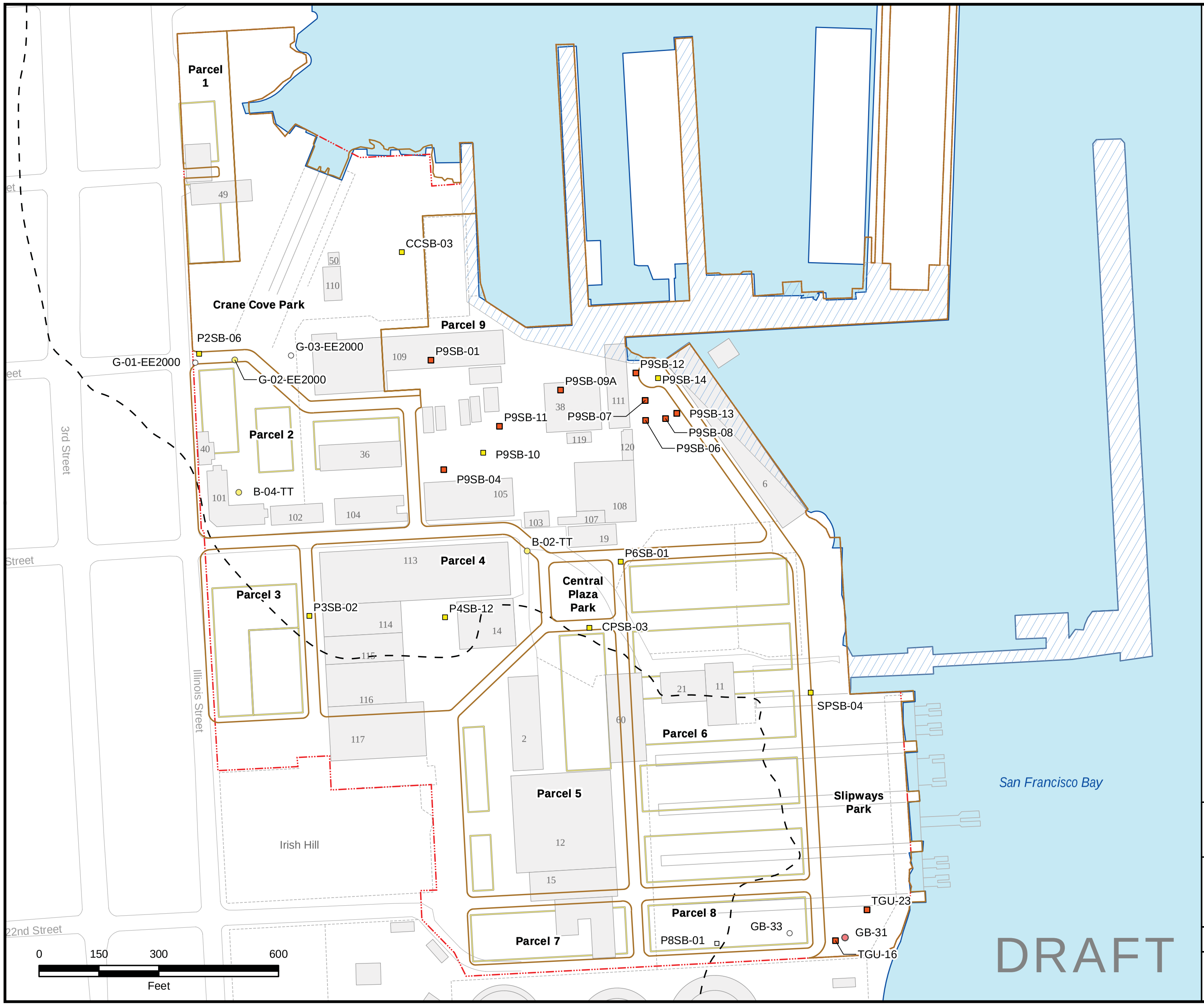
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

METALS RESULTS AND ESL EXCEEDANCES IN SHALLOW SOIL (0-10 FEET)

Date 1/10/2011	Project 4963.01	Figure 21

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-052.mxd



Legend

Historical Sample Location
- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location
- □ Not Detected
- ■ Detected Below ESL
- ■ Exceedance of ESL

Surface Feature
- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
2. Current and recent historical shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/ website/sfshare/catalog/sfshoreext.zip.
3. Approximate 1869 Shoreline based upon Board of Tidelands Commissioners, *Map of the Salt Marsh and Tide Lands and Lands Lying Under Water South of Second Street and Situate in the City and County of San Francisco*, 1869.
4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

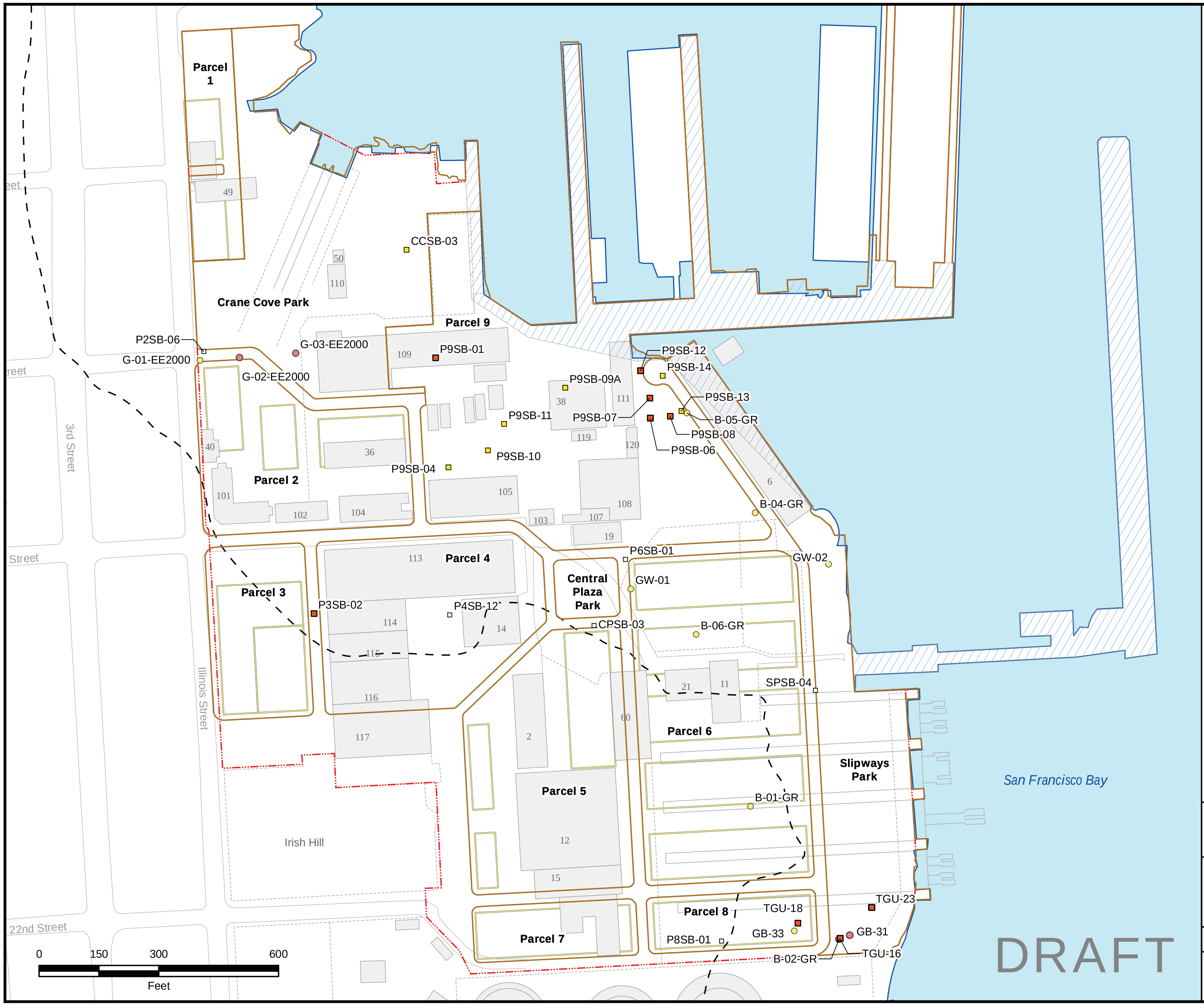
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

TPH RESULTS AND ESL EXCEEDANCES IN DEEP SOIL (>10 FEET)

Date 9/16/2010	Project 4963.01	Figure 22

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-053.mxd



Legend

Historical Sample Location
- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location
- ☐ Not Detected
- ■ Detected Below ESL
- ■ Exceedance of ESL

Surface Feature
- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
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4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

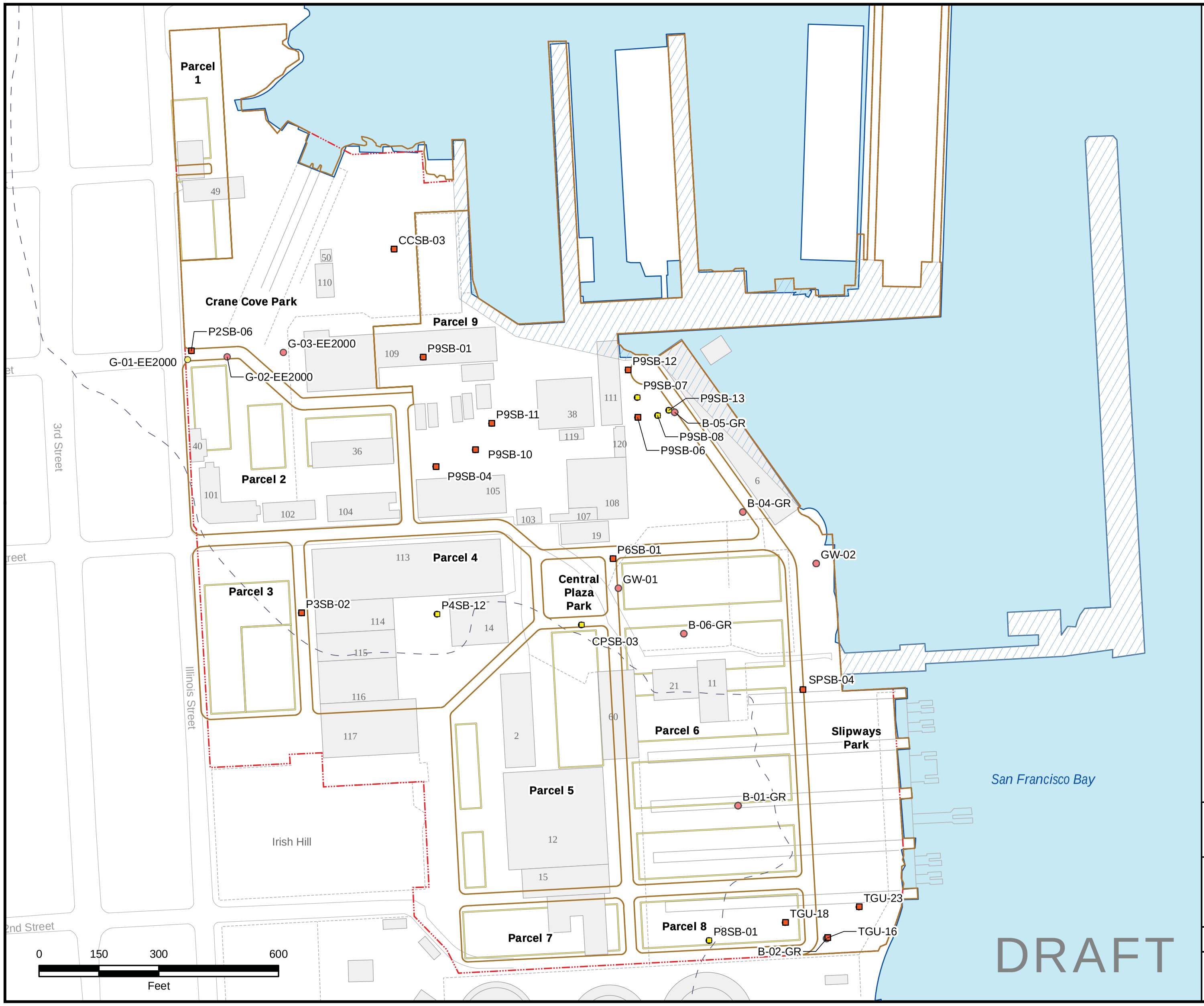
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

PAH RESULTS AND ESL EXCEEDANCES IN DEEP SOIL (>10 FEET)

Date 9/16/2010	Project 4963.01	Figure 23

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-054.mxd



Legend

Historical Sample Location
- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location
- □ Not Detected
- ■ Detected Below ESL
- ■ Exceedance of ESL

Surface Feature
- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- ▭ Building
- ▭ Proposed Building
- ▭ Pier 70 Site Area
- ▭ Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
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4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

METALS RESULTS AND ESL EXCEEDANCES IN DEEP SOIL (>10 FEET)

Date 9/16/2010	Project 4963.01	Figure 24

Treadwell&Rollo

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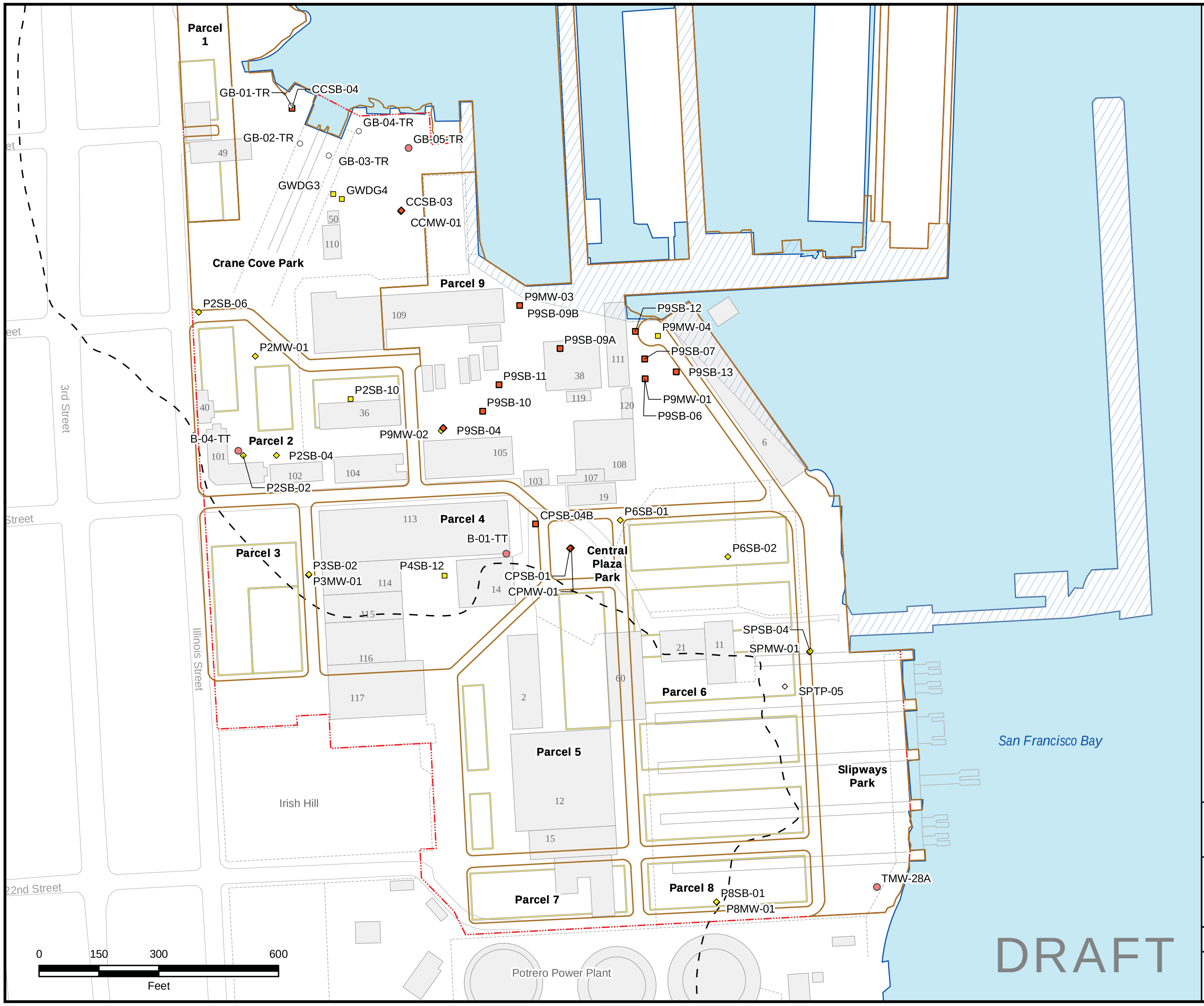

Legend

Historical Sample Location

- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location

Phase 1

- ◇ Not Detected
- ◆ Detected Below ESL
- ◆ Exceedance of ESL

Phase 2

- ■ Detected Below ESL
- ■ Exceedance of ESL

Surface Feature

- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
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4. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

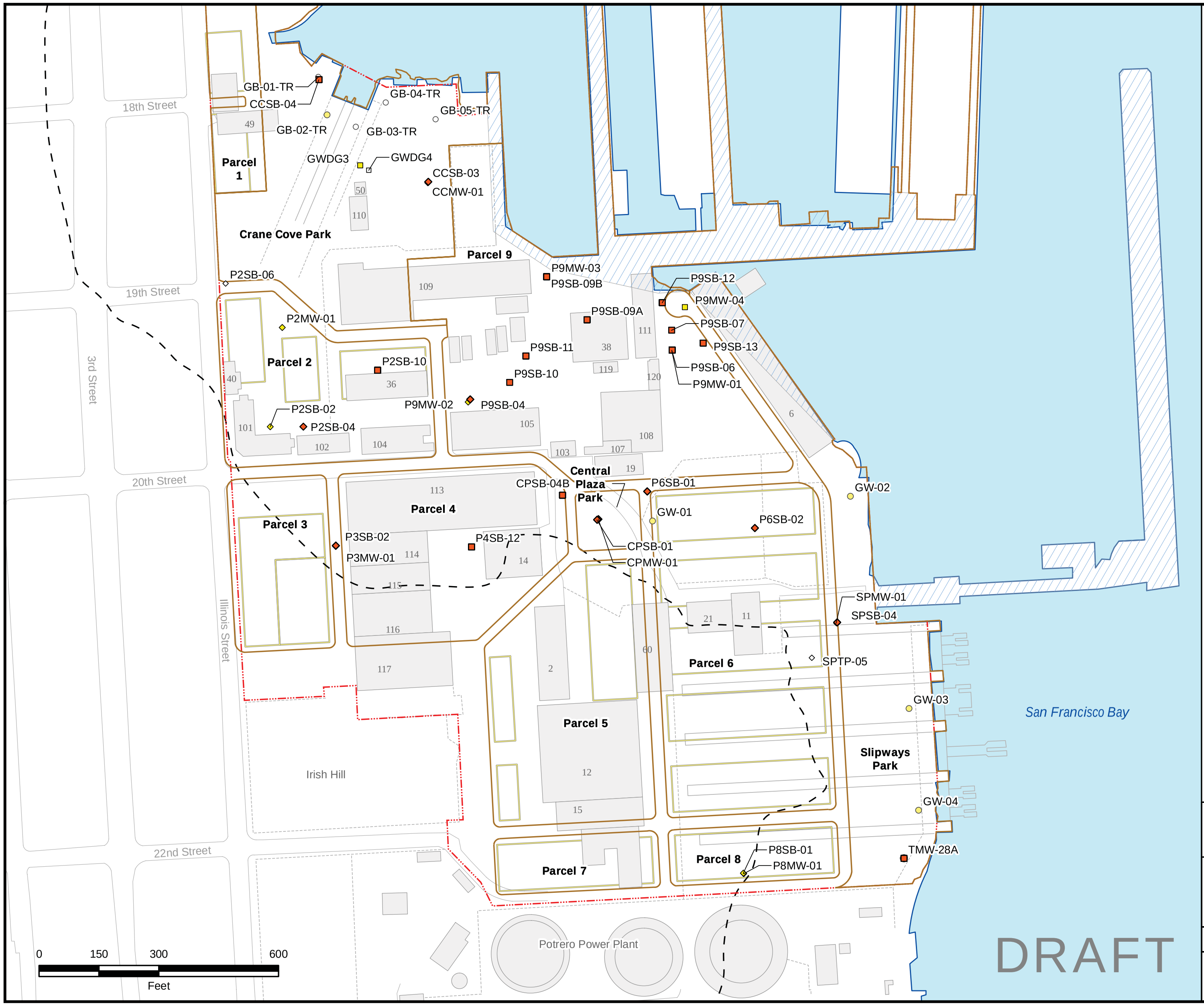
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

TPH RESULTS AND ESL EXCEEDANCES IN GROUNDWATER

Date 9/17/2010	Project 4963.01	Figure 25

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-075.mxd



N

Legend

Historical Sample Location
- ○ Not Detected
- ● Detected Below ESL
- ● Exceedance of ESL

Recent Sample Location

Phase 1
- ◇ Not Detected
- ◆ Detected Below ESL
- ◆ Exceedance of ESL

Phase 2
- ☐ Not Detected
- ■ Detected Below ESL
- ■ Exceedance of ESL

Surface Feature
- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
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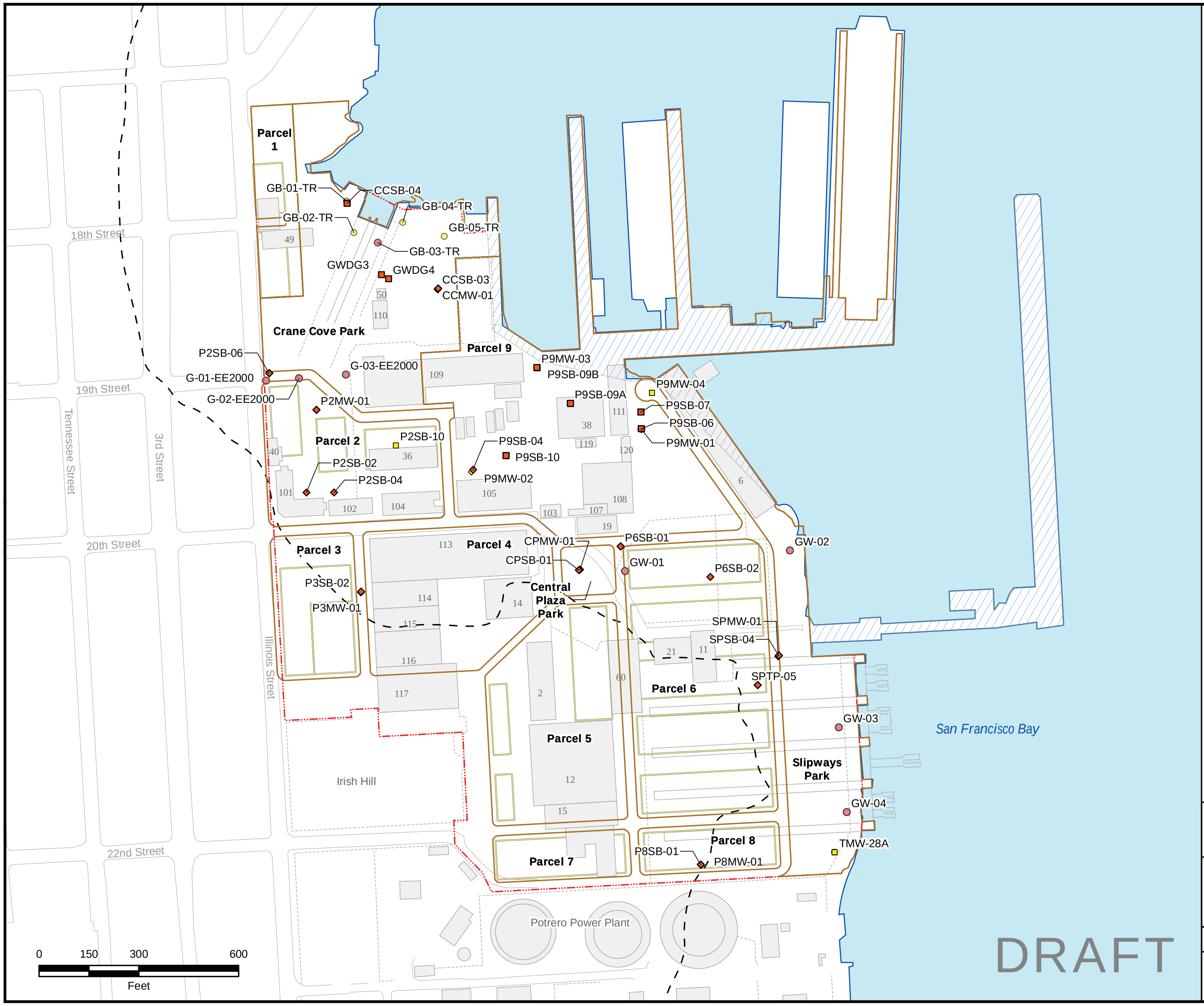
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

PAH RESULTS AND ESL EXCEEDANCES IN GROUNDWATER

Date 9/17/2010	Project 4963.01	Figure 26

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-077.mxd



Legend

Historical Sample Location

○ Not Detected

● Detected Below ESL

● Exceedance of ESL

Recent Sample Location

Phase 1

◇ Not Detected

◆ Detected Below ESL

◆ Exceedance of ESL

Phase 2

□ Not Detected

■ Detected Below ESL

■ Exceedance of ESL

Surface Feature

- - - Fence

— Other

— — Approximate 1869 Shoreline

— Road Edge

▭ Building

▭ Proposed Building

▭ Pier 70 Site Area

▭ Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)

▨ Pile-Supported Structure Over Water

Notes:

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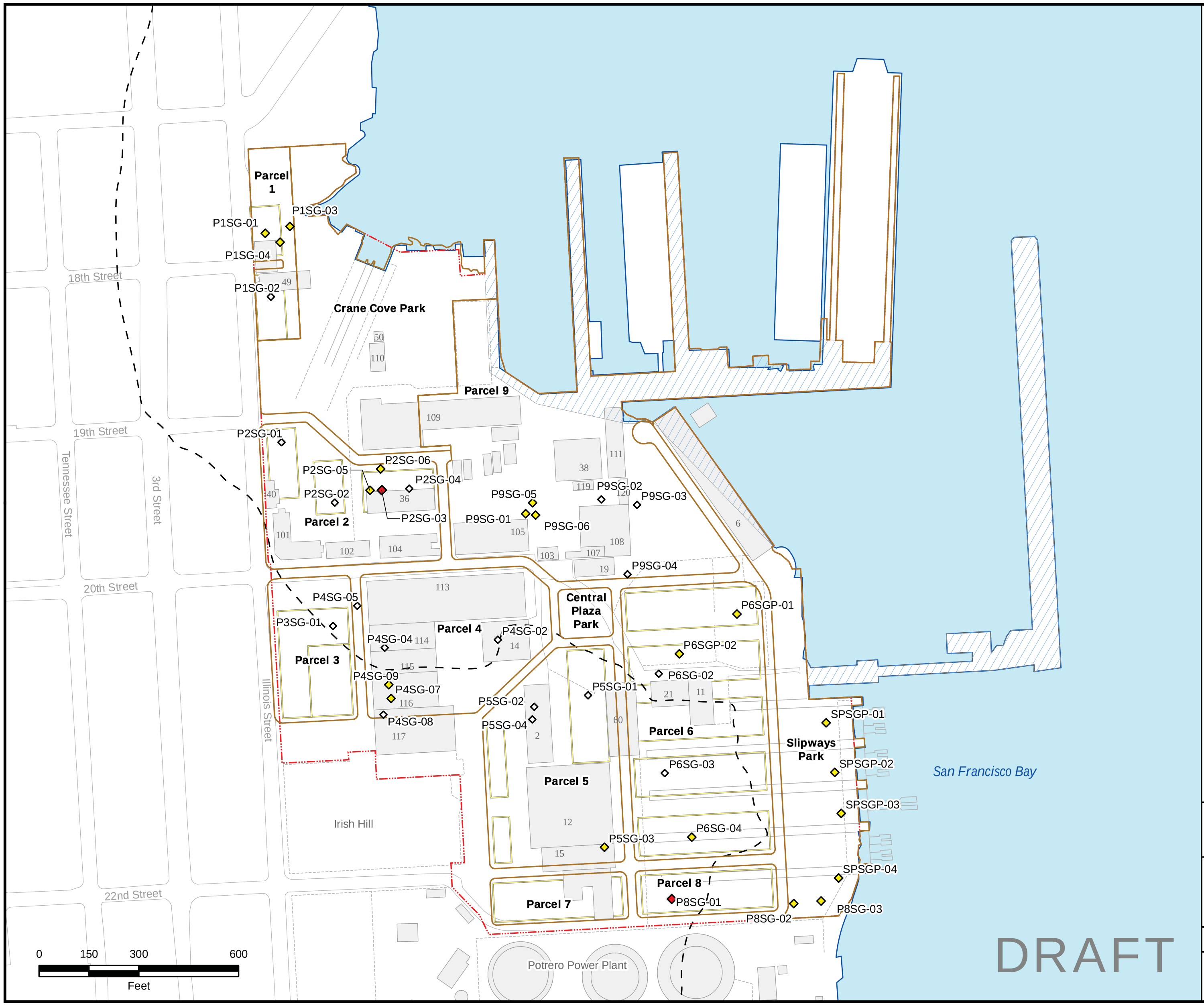
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

METALS RESULTS AND ESL EXCEEDANCES IN GROUNDWATER

Date 9/17/2010	Project 4963.01	Figure 27

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-076.mxd



Legend

Recent Sample Location
◇ Not Detected
◆ Detected Below ESL
◆ Exceed ESL

Surface Feature
Fence
Other
Approximate 1869 Shoreline
Road Edge
Building
Proposed Building
Pier 70 Site Area
Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
▨ Pile-Supported Structure Over Water

Notes:

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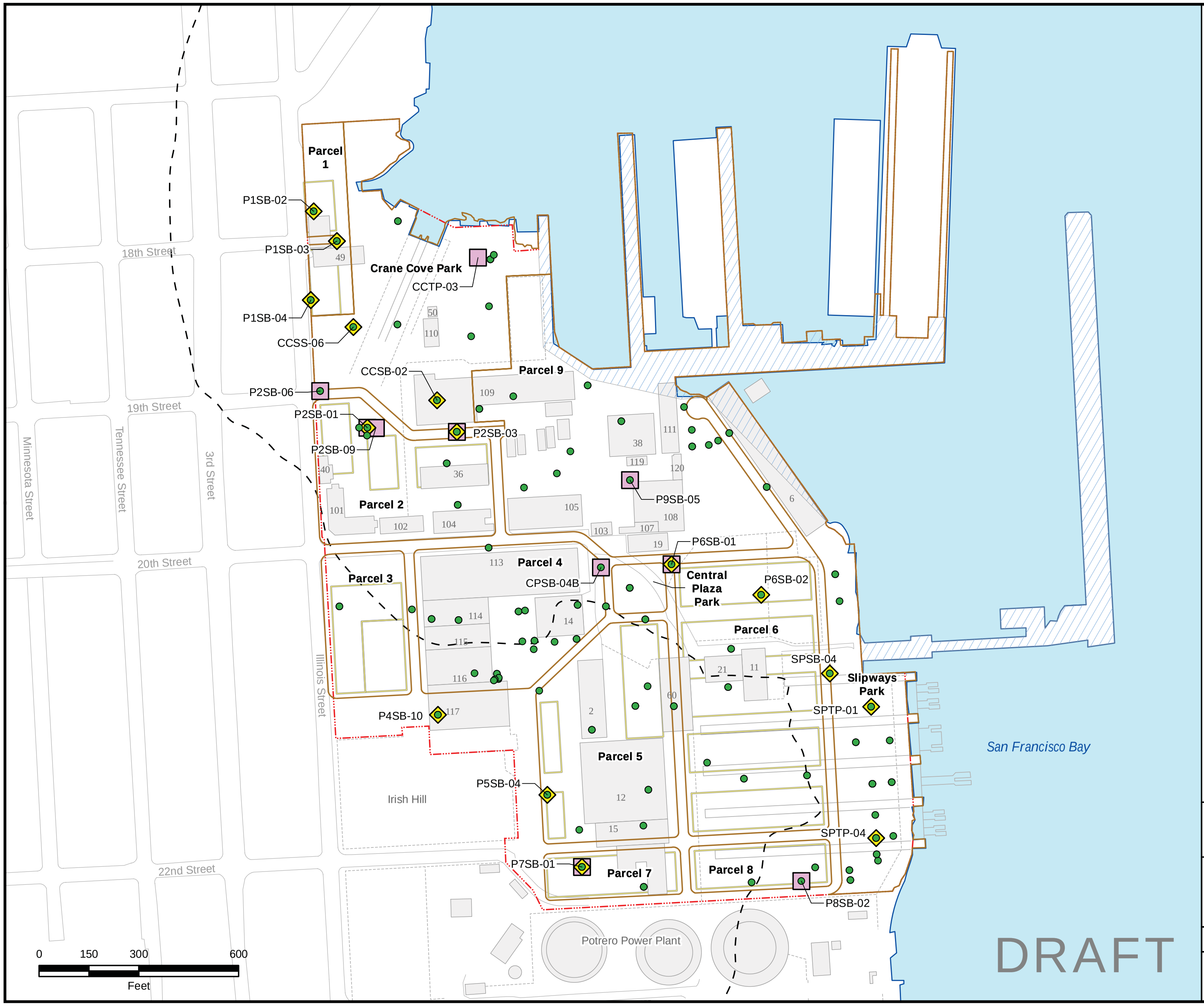
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

ESL EXCEEDANCES IN SOIL GAS

Date 9/17/2010	Project 4963.01	Figure 28

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-059.mxd



Legend

California Hazardous Material Criteria Result

- ● Non Hazardous
- ◆ Exceeded California Soluble Threshold Limit Concentration (STLC) - State of California Non-RCRA
- ■ Exceeded California Total Threshold Limit Concentration (TTLC) - State of California Non-RCRA

Surface Feature

- Fence
- Other
- Approximate 1869 Shoreline
- Road Edge
- Building
- Proposed Building
- Pier 70 Site Area
- Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Some locations show results that both exceed and do not exceed the hazardous waste standards. In such cases, samples were collected at differing depths and provided more than one result per location.
2. No samples exceeded the Federal Toxicity Characteristic Leaching Potential (TCLP).
3. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
4. Shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/website/sfshare/catalog/sfshoreext.zip.
5. Approximate 1869 Shoreline based upon Board of Tidelands Commissioners, *Map of the Salt Marsh and Tide Lands and Lands Lying Under Water South of Second Street and Situate in the City and County of San Francisco*, 1869.
6. Site boundary, parcels, and acreages from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
7. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

CALIFORNIA HAZARDOUS MATERIAL CRITERIA EXCEEDANCES IN SHALLOW SOIL 0 TO 10 FEET

Date 10/5/2010 | Project 4963.01 | Figure 29

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-065.mxd

Legend

Sample Location

- ⊕ Monitoring Well
- ▣ Geotechnical Boring
- ■ Soil
- ● Soil and or Groundwater
- ◆ Soil Gas
- ✦ Soil Gas Probe
- ▨ Test Pit
- – – Approximate 1869 Shoreline
- ➔ Approximate Groundwater Flow Direction

Surface Feature

- ┄ Fence
- — Other
- — Road Edge
- 🟪 Area of Non-aqueous Phase Liquid (NAPL)
- 🟧 Approximate Area of Shallow Bedrock
- ▨ *Historical Manufactured Gas Plant Subsurface Investigation Area*
- ▭ Building
- ▭ Proposed Building
- ▭ Pier 70 Site Area
- ▭ Master Plan Parcel Areas (eg. Parcel 1 = P1, Crane Cove Park = CC, etc...)
- ▨ Pile-Supported Structure Over Water

Notes:

1. Buildings, surface features, and road edges digitized from digital orthophotos 10SEG535775.tif and 10SEG535790, California Spatial Information Library (CASIL) UC Davis, ca 2005, http://archive.casil.ucdavis.edu/casil/.
2. Shoreline based upon San Francisco Enterprise GIS, *Extended San Francisco Shoreline Shapefile*, http://gispub02.sfgov.org/website/sfshare/catalog/sfshoreext.zip.
3. Approximate 1869 Shoreline based upon Board of Tidelands Commissioners, *Map of the Salt Marsh and Tide Lands and Lands Lying Under Water South of Second Street and Situate in the City and County of San Francisco*, 1869.
4. Site boundary and parcels from ROMA Design Group, *Pier 70 Draft Preferred Master Plan*, 17 July 2009.
5. Historical Manufactured Gas Plant Subsurface Investigation Area taken from AMEC Geomatrix , *Report of Results: Subsurface Investigation Activities Evaluation of Impact to Fill and Bay Mud, Potrero Power Plant*, Figure 2, September 2010.
6. Map displayed in California State Plane Coordinate System, Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

PIER 70 ENVIRONMENTAL SITE INVESTIGATION
San Francisco, California

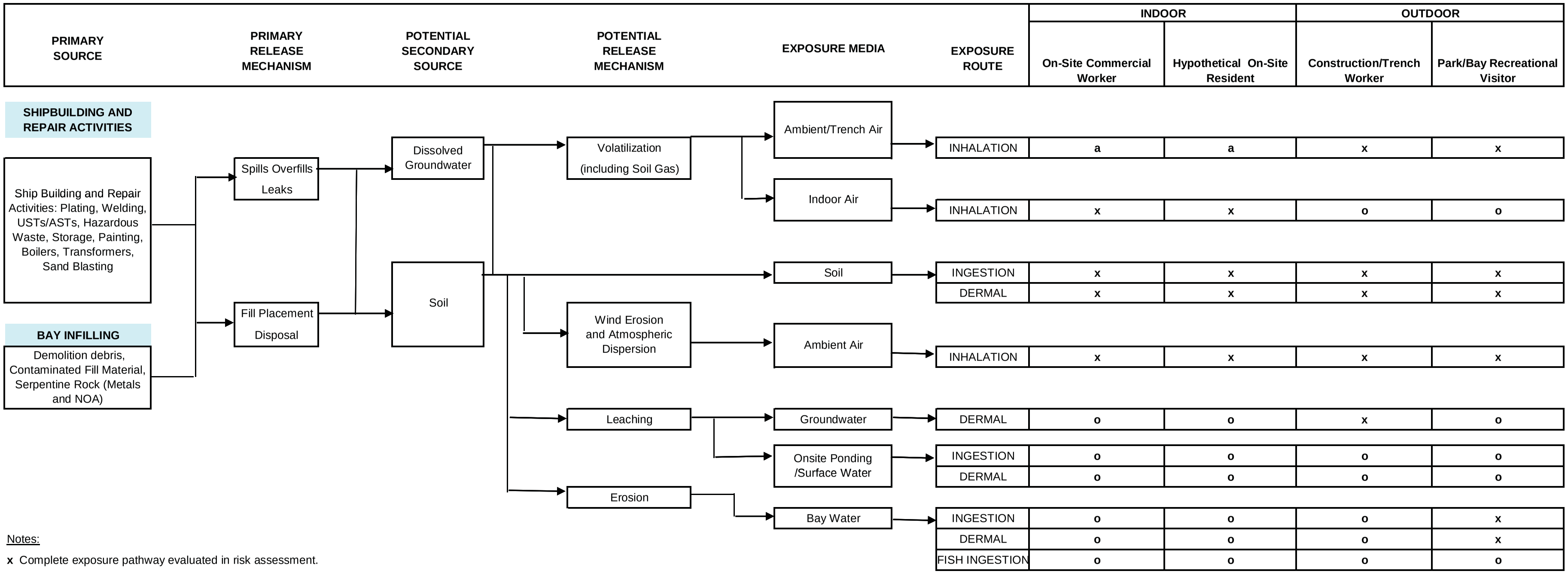
NATURE AND EXTENT OF NAPL IN SOIL AND GROUNDWATER

Date 1/10/2011	Project 4963.01	Figure 30

Treadwell&Rollo

Treadwell & Rollo, C:\GIS\4963 - Pier 70\arcmap_doc\2010\4963-01-060.mxd

FIGURE 31
HUMAN HEALTH RISK ASSESSMENT CONCEPTUAL SITE MODEL (CSM)
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
SAN FRANCISCO, CALIFORNIA



Exposure Media	Exposure Route	INDOOR On-Site Commercial Worker	INDOOR Hypothetical On-Site Resident	OUTDOOR Construction/Trench Worker	OUTDOOR Park/Bay Recreational Visitor
Ambient/Trench Air	INHALATION	a	a	x	x
Indoor Air	INHALATION	x	x	o	o
Soil	INGESTION	x	x	x	x
	DERMAL	x	x	x	x
Ambient Air	INHALATION	x	x	x	x
Groundwater	DERMAL	o	o	x	o
Onsite Ponding /Surface Water	INGESTION	o	o	o	o
	DERMAL	o	o	o	o
Bay Water	INGESTION	o	o	o	x
	DERMAL	o	o	o	x
	FISH INGESTION	o	o	o	o

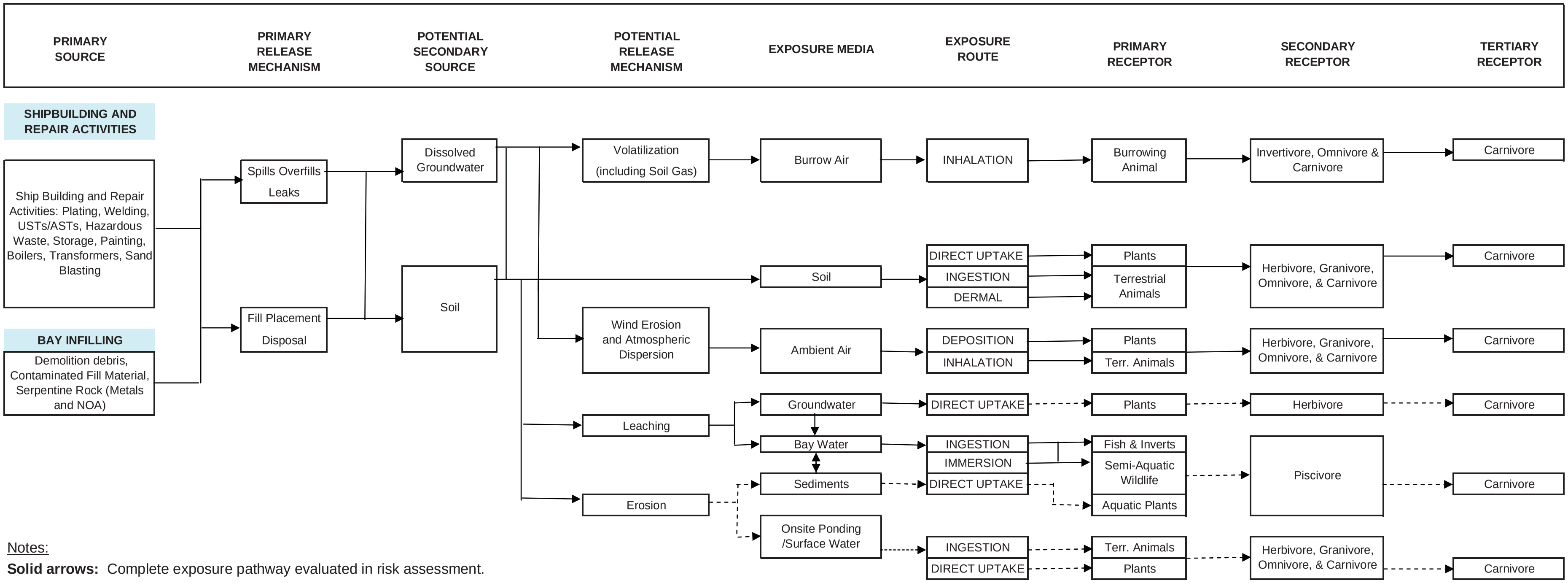
Notes:

x Complete exposure pathway evaluated in risk assessment.

o Incomplete exposure pathway; not evaluated in risk assessment

[a] Assumed that indoor vapor intrusion pathway is protective of outdoor soil vapor exposures for the residential and commercial receptors. Therefore ambient air exposures were not evaluated for volatile chemicals.

FIGURE 32
ONSHORE ECOLOGICAL RISK ASSESSMENT CONCEPTUAL SITE MODEL (CSM)
PIER 70 ENVIRONMENTAL SITE INVESTIGATION
SAN FRANCISCO, CALIFORNIA



Notes:

Solid arrows: Complete exposure pathway evaluated in risk assessment.

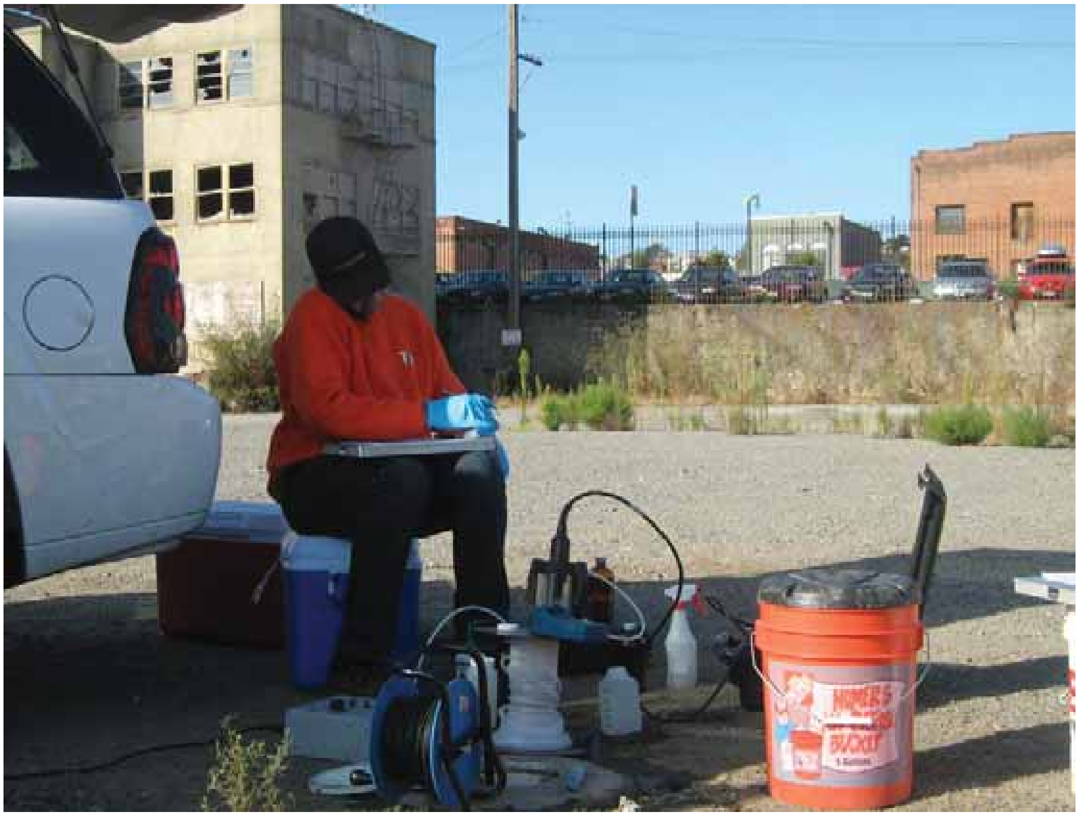
Dashed arrows: Incomplete exposure pathway; not evaluated in risk assessment.

PHOTOGRAPHS

Photo 1 - Direct Push Drilling at the BAE, Parcel 9

Photograph 2 – Utility Clearance BAE, Parcel 9

Photo 3 - Grab groundwater sampling BAE, Parcel 9



Photograph 4 - Monitoring well sampling Crane Cove Park

Photo 5 - Test Pit Sampling Slipway Park

Photograph 6 - Bay fill material, Slipway Way Park SPTP-01

Photograph 7 - Crane Cove Test Pit Sampling, CCTP-01

Photograph 8 - Trench of former slipway, CCTP-01

Photo 9 - NAPL observed on bailer, P9SB06

Photograph 10 - NAPL Sample, P9SB-04